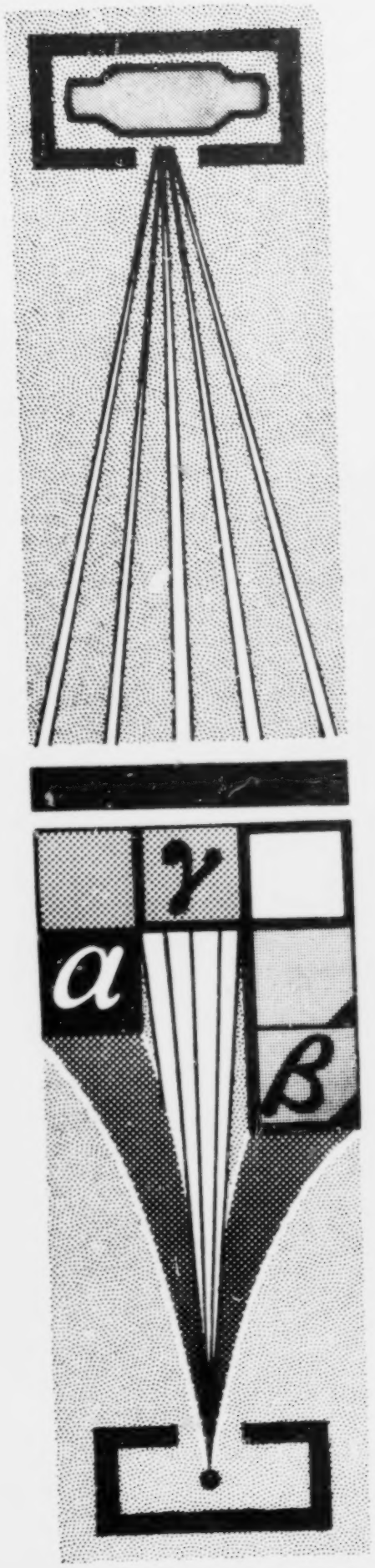

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NUCLEAR MEDICAL TECHNOLOGY TRAINING

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NUCLEAR MEDICAL TECHNOLOGY TRAINING

Proceedings of a Colloquium held on
February 28, 1969
at the Radioisotope Laboratory, Cincinnati
General Hospital, Cincinnati, Ohio

Edited by:
Guy H. Simmons, M.S.
Division of Medical Radiation Exposure

JUNE 1971

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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FOREWORD

The Bureau of Radiological Health implements a national program designed to reduce the exposure of man to hazardous ionizing and nonionizing radiation.

Within the Bureau, the Division of Medical Radiation Exposure deals with 1) the reduction of unproductive ionizing radiation exposure of patients, workers, and others exposed by the use of x rays and other machine-produced ionizing radiation, radioactive materials and radiopharmaceuticals, and 2) the improvement of radiological "systems" and methodology in the healing arts.

The Bureau publishes its findings in appropriate scientific journals and technical report series for the Bureau's divisions, offices, and laboratory.

The technical reports of the Division of Medical Radiation Exposure allow comprehensive and rapid publishing of the results of intramural and contractor projects. The reports are distributed to State and local radiological health program personnel, Bureau technical staff, Bureau advisory committee members, university radiation safety officers, schools, the press, and other interested individuals. These reports are also included in the collections of the Library of Congress and the National Technical Information Service.

I encourage the readers of these reports to inform the Bureau of any omissions or errors. Your additional comments or requests for further information are also solicited.

John C. Villforth
Director
Bureau of Radiological Health

PREFACE

Contained herein are the proceedings of a colloquium on nuclear medical technology training held at the University of Cincinnati Radioisotope Laboratory in the Cincinnati General Hospital on February 28, 1969. The colloquium was jointly sponsored by the Bureau of Radiological Health and the Radioisotope Laboratory. Representatives of interested medical societies as well as government officials and college and university administrators were in attendance.

The rapid growth of nuclear medicine has resulted in a shortage of qualified paramedical personnel, and future growth and development are threatened by this shortage. In keeping with its commitment to help promote safe and efficient means by which maximum benefits may be derived from the medical use of radiation, the Bureau of Radiological Health has supported a project at the University of Cincinnati to establish pilot training programs in nuclear medical technology. The objectives of this project are (1) to train qualified technologists who can, with experience, help teach nuclear medicine technicians, thereby increasing the number of persons qualified to work in nuclear medicine training programs; (2) to develop curricula and training materials which may be used by others in training nuclear medicine technologists and technicians; and (3) to investigate, through pilot programs, various teaching methods in nuclear medicine.

The objectives of this colloquium were to present the progress to date on the project at the University of Cincinnati and to promote open discussion on such topics as course content, levels of training, backgrounds of people entering specialized training in nuclear medicine, etc. Review copies of a training manual prepared at the University of Cincinnati were distributed to the colloquium participants with a request for their evaluations and suggestions for improvement.

The program consisted of a report on the Cincinnati nuclear medical technology project, short presentations by the participants on other nuclear medical technology training and related matters, workshop sessions on key questions related to these training activities, group reports from the workshops, and open discussions throughout the colloquium.

Arve H. Dahl
Acting Director
Division of Medical Radiation Exposure

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SUMMARY

This 1-day colloquium on nuclear medical technology training began with short presentations by the participants. The curricula developed at the University of Cincinnati under a training grant from the Bureau of Radiological Health were described and discussed. Two pilot programs in nuclear medical technology have been established at the University of Cincinnati, at both the baccalaureate and associate degree levels. The baccalaureate program is a "3 + 1" curriculum, i.e., the first 3 years are spent in the College of Arts and Sciences taking basic science and liberal arts courses, and the senior year is an internship in the Cincinnati General Hospital spent primarily in the Radioisotope Laboratory. The associate degree program is a "1 + 1" curriculum which starts in the fall of 1969 at the Raymond Walters Branch of the University of Cincinnati. The internship for the associate degree program is more limited in scope and less rigorous than that for the 4-year curriculum.

Next, certain of the participants who represented societies, government agencies, colleges and universities, and other training programs presented summaries of the activities of their respective groups in nuclear medical technology training. These included respresentatives from the U.S. Public Health Service, Bureau of Radiological Health; Oak Ridge Associated Universities; the Society of Nuclear Medical Technologists; Society of Nuclear Medicine; Veterans Administration; University of Cincinnati Community Colleges; University of Iowa; Nuclear Medicine Institute; American Society of Clinical Pathologists; American Society of Medical Technologists; American Society of Radiologic Technologists; and the U.S. Public Health Service, Bureau of Health Manpower.

Their presentations and the ensuing discussions revealed that there is general agreement that two levels of training are indicated. It was the consensus that training programs that offer academic credit are desirable. Hence, programs should be established that lead to either an associate or baccalaureate degree. Individuals going through a 2-year program would be called Nuclear Medicine Technicians, whereas those earning a baccalaureate degree would be termed Nuclear Medical Technologists. Those who have had experience with hospital based programs which require no college level work as prerequisite to the specialized training in nuclear medicine expressed general dissatisfaction with this approach. It was agreed that at least 1 year of college level science and liberal arts courses is important prior to entering the clinical training. Some of the difficulties arising from the multidisciplinary involvement in the practice of nuclear medicine were brought out. Pathologists, internists, and radiologists all practice nuclear medicine, and each one looks for something different in a technologist. It was agreed that so long as a broad educational background is gained and certain essentials are included in the clinical training, an individual could adapt to the different emphases placed on the practice of nuclear medicine by the different specialties.

For the afternoon session, four workshops were formed with each group addressing itself to specific preassigned questions. The questions had to do with (1) estimating the present and future needs for additional technologic personnel in nuclear medicine, (2) the content of the academic work in associate and baccalaureate programs, (3) methods of recruitment, and (4) future involvement of government agencies in sponsoring training programs. Highlights of the group reports are as follows:

It is anticipated that the largest increase in the need for technologists will be in the community hospitals, because 5 years from now a much larger percentage of such hospitals will have nuclear medicine laboratories than do now. Most large medical centers already have nuclear medicine laboratories, and their increase in personnel needs will reflect expansion rather than new facilities. The increase in the number of technicians needed (2-year people) will far exceed that for technologists in the community hospitals (100 to 500 beds).

One calendar year (4 quarters) of academic work should precede 12 months of accredited clinical training in the technician training programs. This formal study should include:

	quarter hours
English (language, composition, literature)	12
Social Studies (psychology, sociology)	9
Mathematics elective (college algebra or above)	9
Anatomy, Physiology, and Biology	15
Chemistry (lecture and laboratory)	12
Physics	8
	65

The baccalaureate programs for technologists should meet the general requirements for that degree established by the college along with the following science core as prerequisite to the 12-month clinical internship. This core should include the equivalent of the following:

	quarter hours
Mathematics elective (college algebra or above)	9
Physics	12-15
Anatomy and Physiology (to include elementary bacteriology)	28-30
Chemistry (general, organic, analytic, elementary biochemistry)	28-30

Recruiting should begin in junior high school with as much personal contact as possible with the guidance counselors. Recruitment materials such as films and brochures should be developed and presented at school

programs. The Society of Nuclear Medicine should establish a clearinghouse for available positions and technologists. (This has already been initiated by allocation of space in the *Journal of Nuclear Medicine*.)

Many government agencies are interested in promoting training programs in nuclear medical technology as well as in other paramedical fields. These include the Veterans Administration, Atomic Energy Commission, Department of Labor, and Department of Health, Education, and Welfare (Bureau of Radiological Health, Bureau of Health Manpower, National Institute of General Medical Sciences, Office of Eduction). Some development programs are currently being supported, and the Veterans Administration is currently implementing a program to train both physicians and technologists in approximately 80 hospitals. Although funds are scarce, anyone seeking support for developmental training programs should submit proposals to the interested agencies.

During the final discussion period of the day, the participants expressed general agreement with the fifth revision of the "Essentials of an Acceptable Educational Program in Nuclear Medicine Technology" prepared by the AMA ad hoc committee chaired by Dr. Earle Chapman. The participants urged ratification of this document by all concerned as soon as possible.

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BUREAU OF RADIOLOGICAL HEALTH NUCLEAR MEDICINE MANPOWER INTEREST

Arve H. Dahl, Acting Director
Division of Medical Radiation Exposure[1]

We in the Public Health Service, Bureau of Radiological Health, have a basic interest in nuclear medicine, and Dr. Raymond Moore will speak on our overall interests later this morning. You will recall that in August 1967, many of you attended a symposium at Michigan State University on the subject of reducing radiation exposure in nuclear medicine, and some of our problems were discussed at that time. I am concerned with Bureau of Radiological Health training and manpower development activities. We in the radiological health program have devoted approximately 20 to 25 percent of our resources to these activities over the years since we began actively developing specific programs in 1948 and 1949. In the intervening years our efforts have grown in three directions. First we have provided technical short courses, primarily job related training for state and local health employees and for others working in radiation detection and control work with the purpose of bringing new knowledge to them, orienting new people, and special courses for carrying out specific jobs. Secondly, we have conducted a major program in producing new manpower for the radiation protection field. A two million dollar radiological health specialist training grant program has been operating since about 1960. At the present time programs are supported in 32 universities in post-baccalaureate education in the radiological health sciences, in addition nine undergraduate (2-year) developmental demonstration projects at the technology level. One of those happens to be this project we look at today. Thirdly, we have a major program effort in special studies on manpower and this continues to be a major effort. One of the projects recommended there, under Special Projects, was Nuclear Medical Technology.

We feel we are protecting and reducing radiation exposure to people by having well-trained people, and that is the purpose of why we are here. We don't expect to support all of the needed projects, but we feel that because of our interests in the radiological health sciences we must attempt to participate in the development of prototype projects which will assist and serve the scientific community that is using radiation in achieving their goals.

Many of the groups represented here today have participated in developing essentials for nuclear medical technology, and a number of you have made significant efforts in trying to develop programs for training radioisotope technicians and nuclear medical technologists. We feel that, as a part of any project we support, it is important to invite the concerned group to hear what we are doing and to serve as a means of improving communications between those who are working toward a common cause.

---

[1]Formerly Chief, Training and Manpower Development Program

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UNIVERSITY OF CINCINNATI PILOT NUCLEAR MEDICINE TECHNOLOGIST AND TECHNICIAN TRAINING PROGRAMS

James G. Kereiakes, Ph.D.
University of Cincinnati

I would like to say a few words concerning our program. First, let me say that General Hospital is the training hospital of the University of Cincinnati Medical Center with a commitment of the staff members to train. There is a need for particular manpower needs, allied health personnel, or paramedical personnel, whatever you want to call them, and we are talking specifically here today about nuclear medicine technology. Because of the need for these types of individuals and also because of the capabilities that exist here at General Hospital in the Radioisotope Laboratory, under the guidance of Dr. Eugene Saenger, and the Nuclear Medicine Unit of the Bureau of Radiological Health, under the guidance of Dr. Henry Wellman, we have become deeply involved in the training of nuclear medicine technologists. The first decision we had to make upon entering this field of training was the level of training, and whereas in many places this may have presented a problem, this was no problem here. It was the unanimous opinion of the staff members here that there should be a degree associated with the training and so immediately we were talking about an associate degree or a bachelor's degree. At the time we started thinking about this training, the 2-year program at the Raymond Walters Branch of the University of Cincinnati was just being developed. We have Dean Krueger here from the Raymond Walters Branch. It was not right at that time for us to get into a 2-year program immediately, so we proceeded with the 4-year baccalaureate program.

The Cincinnati Nuclear Medical Technologist Program

We looked over the various baccalaureate degrees offered at the University---there was a possibility of a bachelor's degree in biology with a 12-month internship program. It is difficult in the basic sciences to come up with a bachelor's degree that also contains in it a 12-month internship program during the 4 years. We are fortunate here at the University of Cincinnati that we have an excellent medical technology program. In looking over the courses offered by the medical technology curricula, the first 2 years were very much what we felt the first 2 years for our nuclear medical technologists should be. So we then proceeded along the lines of trying to incorporate a program within the present existence of this medical technology program. This saved us some time also because to institute a new program, as all of you know, requires going through all echelons up to the top, including the Board of Regents, as I understand it. This approach allowed us to proceed fast within the existing program. We did see a course modification during the junior year. We replaced some of the courses with courses in physics, anatomy, and physiology. The normal medical technology program has a 12-month internship already built into it where the techs go to General Hospital or to one of the other associated hospitals in the area. This

meant we would replace the 12-month internship of the med-tech with a 12-month internship in the nuclear area, namely, the Radioisotope Lab of General Hospital. We proposed this and had no trouble having it accepted because it was within the framework of the existing program. We ended up with a baccalaureate degree in medical technology with a nuclear option. The program consists of the medical technology curricula, with alteration of a couple of courses in the junior year, and a 12-month internship in the Radioisotope Laboratory. For this 12-month internship, the students receive 45 credit hours. They do receive grades for these courses. The curriculum for the 4-year program is included in the handout material and will be included in the colloquium report (appendix A). The 12-month internship, which I think you will find particularly interesting, includes the following:

Nuclear Physics and Instrumentation consists of five didactic lectures plus two laboratory exercises a week, in the summer quarter. Primary attention is given to the fundamentals of physics and mathematics and the principles of nuclear instrumentation, so that the individuals understand the physical aspects of the use of isotopes in medicine.
in medicine.

Radionuclide Measurements consists of five didactic lectures and two laboratory exercises a week. This course is a follow-up to the instrumentation course and stresses the functioning of the various types of counting equipment and the operating characteristic of each.

Radiation Protection consists of three lectures a week in the winter quarter; safe handling of radioactive material is stressed. The point we have elaborated on here is obtaining the maximum amount of information from the diagnostic tests while minimizing exposure to the patient.

Tracer Methodology and Radiopharmaceuticals consists of three lectures per week in the spring quarter, involving primarily the production and physical and chemical properties of radiopharmaceuticals, the dilution technique, and application of this technique to isotope procedures.

Clinical Applications of Radionuclides is given in winter and spring. This course consists of a series of 22 lectures dealing with the diagnostic and therapeutic uses of radionuclides, scanning, including technical aspects, special techniques such as liquid scintillation counting, and newer developments in radiopharmaceuticals. These lectures are given by staff members here who specialize in the particular areas.

Hematology and Laboratory Chemistry consists of two lectures per week in winter and spring.

Technical Evaluation of Nuclear Medicine Procedures is a particularly important activity. It is a review session or read-out session at the end of every day, where the staff physician, staff members, the chief nuclear medicine technologist, and the student technologists get together

and review and interpret the cases done for that day. Now this is particularly important to the technologists because it offers them the necessary relationship between the work that they do and the significance of this work in the practice of medicine. Also discussed are the technical factors used and the effects they may have upon the outcome of the study.

Clinical and Nuclear Medicine and Hematology Practicum is on-the-job training where the technologist performs all the procedures done in a radioisotope laboratory. They work closely with the staff physician and with the experienced nuclear medicine technologists and learn by doing all of the procedures.

The Nuclear Medicine Technician Program

At the same time we talked to Dean Krueger of the 2 year college and we were able to initiate a program, which, being a new program, had to be processed through all the echelons and finally approved. We now have an associate degree program, to be initiated this fall, and we are presently recruiting our first candidates for this program. This is a 1-year academic and a 12-month internship program.

Student Recruitment

Now, a few words about recruitment. One of the staff members, either Guy Simmons or Dr. Wellman or I, will appear at the freshman orientation for these students. We come before them twice in their sophomore year, and each time we take brochures and we discuss and pass out this material to the students. During the sophomore year they actually tour the hospitals and we make sure that they tour the Radioisotope Laboratory where they can see our facilities. To enter our baccalaureate program, they make their decision at the end of their sophomore year because of the revision of the courses included. The program is listed in the University Catalog. One point I would like to make is that recently we have seen a decrease in the number of students in the medical technology program. I bring this to your attention because we have noticed it here. This is, I think, Dean Krueger, because of the start of the 2-year programs, in several places. This has caused a decrease in the number of students in the medical technology 4-year programs, at least that is our experience here. Because of this we have entered into a similar arrangement with other universities in the area who have medical technology programs. This includes Thomas More College in Covington and Our Lady of Cincinnati College here in Cincinnati, and we are presently offering this program to med-tech students in those colleges. In fact, one of the two students who will enter the internship this June will receive her bachelor's degree from Thomas More College.

We have been able to attract the top students in medical technology programs into this nuclear medical technology option. This has been particularly heartening to us. We have had either the top student or one of the two top students every year. One of the two graduates last June was Phi Beta Kappa, and the girl who will graduate this June is, as I understand it, a strong candidate for Phi Beta Kappa. Those of us who have lectured to these students have been particularly impressed with their capabilities to comprehend the information given them. There is no problem here as far as discussions of window analysis, multichannel analyzers, etc.

For the associate degree program which we are initiating full blast this fall, we have distributed a brochure, which you see here, to the various high schools and to the counsellors in these high schools throughout the area, primarily through the Health Careers Association of Greater Cincinnati. As in most places, we have high school health career days here where high school seniors visit the medical center. They listen to lectures and tour the facilities and we make sure that during this time they also visit the Radioisotope Laboratory. Guy is planning to go to two high schools within the next 3 weeks to talk to seniors concerning our programs here at the University.

Our 2-year program is just being initiated and we have had no actual experience with 2-year students wanting to complete the 4-year nuclear medical technologist programs. Let me say the reason for our thinking in terms of a degree is not to provide a complete block as far as the individual's training is concerned. Having an associate degree, they can then go on to a bachelor's degree if they desire. Where there is no degree associated with 2 years of training, they would really have to start from scratch.

Certification

A few words about certification. Graduates in the baccalaureate program are elibible to take the certification examination in nuclear medical technology given by the Registry of Medical Technology of the ASCP (American Society of Clinical Pathology). These are our baccalaureate students. For the associate degree students, we have recently made arrangements that the 2-year candidates will have fulfilled the requirements for the certification in nuclear medicine of the American Registry of Radiologic Technologists.

Graduates

In terms of the numbers trained, we have presently trained four students, as of this June. This is not a large number but the caliber has been excellent. Two students with previous bachelor degrees have also taken the 12-month internship program. We are, therefore, open also to people who have bachelor's degrees who desire to take a 12-month internship,

if they fit right in with what we are doing. The associate degree, as I have indicated, will start (we are actively recruiting for the first class) this fall.

We encourage the students to participate in research. The first graduate of this program, Patty Knupp, completed her research project and presented the work at Seattle in the technologist session of the Society of Nuclear Medicine Meeting. The graduate is also completing her research project this June and has forwarded an abstract for possible presentation at the Society of Nuclear Medicine meeting in New Orleans in the Technologist session.

As far as job placement is concerned, we have had no trouble placing the first four students. The first student went to the Veterans' Hospital in Cincinnati as a nuclear medicine technologist and spent about a year and a half there. About six months ago she joined the staff over at the Shrine Burns Institute as a nuclear medicine research assistant, where she has been actively involved in triple-space studies for determining plasma volume, red cell mass, and extracellular fluid in control children and burned children. Of two graduates last June, one is presently here in the Radioisotope Laboratory and is assisting in the nuclear med-tech program. The second girl is a nuclear medicine technologist at Peter Bent Brigham Hospital in Boston. The graduate this June has already been employed at a newly developed radioisotope laboratory at Jewish Hospital here.

Training Manual

A word about the Training Manual. As part of the project, supported by the Bureau of Radiological Health, part of the aim was to develop a training manual, which all of you have received. Although this Training Manual is primarily one that is used for the baccalaureate program here, the content of it is general enough that it could be used for various types of programs and for various levels of programs. This is the first printing of this manual. There were only 35 copies printed, primarily for this meeting, so that we could pass it out to you. Please make your comments and corrections in the material prior to the second printing of a larger number of copies. We sincerely hope that you will make a note of any critical comments concerning this manual and turn it in to Guy Simmons. At the time of the second printing it can be an improved manual, although we think it is pretty good right now.

Project Staff

The staff includes Dr. Saenger, Director of the laboratory and a radiologist by training; Dr. Silberstein, who has just recently joined us and who is an internist by training, he is a full-time staff member in the Radioisotope Laboratory; Dr. Wellman, who is head of the Nuclear Medicine Unit here of the Bureau of Radiological Health and is an internist by training; two physicists, myself and Dr. Gus Bahr; and Guy Simmons who

has been assigned here to this project by the Bureau of Radiological Health and is a physicist by training. In addition to them we have Vince Sodd of the Nuclear Medicine Unit, who has been contributing to this program, particularly in the areas of some of the lectures dealing with the production and development of newer radiopharmaceuticals. Dr. James Mack, who is a radiologist by training and is presently with the Bureau of Radiological Health, also delivers some of the lectures. It is a cooperative effort. We all chip in with whatever specialties we have in training these students.

DISCUSSION

DR. SAENGER: Jim, I think it is important to emphasize that these girls attend every day we read out the cases.

DR. KEREIAKES: As far as we are concerned, that is one of the more valuable parts of this 12-month internship---to sit in and listen to the staff physicians discuss and interpret the cases. In case there is a scan that doesn't look too satisfactory, discussion includes the technical factors involved in making that scan and how they could have been improved.

DR. SAENGER: Well, they actually enter into the discussion if they have questions or clinical information which none of us could elicit. They are considered, as are all of our technical people here, as being of equal importance as we do not have a "pecking order" where some guys talk and others never speak up.

DR. WELLMAN: They also find out what they do wrong. The student technologists are able to see the results of tests they have completed and learn from their mistakes by attending "read-out" sessions.

DR. KEREIAKES: Yes, and so far we have had no problems. We would like to attract more men into the program and we are working on this matter.

DR. RUSSELL: Why would someone choose the 4-year program when he can complete the 2-year program and enter the job market at, I suppose, approximately the same salary?

DR. KEREIAKES: No, I don't think you can go out at the same salary.

DR. RUSSELL: But certainly at a good salary.

DR. KEREIAKES: Yes, at a good salary. Let me say that as to the salary for the nuclear med-tech individuals, the minimum salary would be the same salary as for the regular med-techs. But, because of their specialty they will also command a slightly larger salary. In terms of their progress after they get out into the field, if they have the baccalaureate degree I think they can advance more rapidly, whereas with the associate degree they would be more limited, salary-wise and position-wise.

DR. SAENGER: First, let me introduce Dr. Yvonne Russell, whom you have not had the privilege of meeting. Dr. Russell is our Assistant Dean here at the College of Medicine and is concerned with the problems of training allied health professionals and we were very fortunate to have her sit in with us today.

One of the things we hope these 4-year trainees could do would be to go to a community hospital and, perhaps, set up a training program at a 2-year level, and, secondly, to be a technician in a relatively large laboratory where they might have several of the 2-year people working under them. I think there is no question that they can work at a much higher level than a 2-year trainee. What they choose to do and how this will all work out remains to be seen.

DR. RUSSELL: At this point, are you going to be able to have recruitments for both programs with no conflict between them?

DR. WELLMAN: Actually, Jim Kereiakes hid a little light under the basket as the trainees he cited were only the trainees who have gone on for the BS degree. We have trained some six or seven other individuals in the course here each year for our own purposes, girls who came into the laboratory who did not have nuclear medicine training. Most of these individuals have only had 1 or 2 years of college and we have found that they do not have the capabilities or potential of the girls with a BS degree. They just don't have the ability to run a laboratory in the sense of understanding and supervising.

DR. KEREIAKES: I am sure that in 15 or 20 years the 4-year program will have more men than women. The women will be primarily in the 2-year program.

QUESTION: What are the student fees?

DR. KEREIAKES: In this project, full student tuition is paid for in the junior year and the tuition in the senior year is reduced somewhat because of the hospital internship, so they do receive their tuition for their junior and senior years.

OAK RIDGE ASSOCIATED UNIVERSITIES NUCLEAR MEDICINE TECHNOLOGY TRAINING ACTIVITIES

Lawrence Akers, Ph.D.
Oak Ridge Associated Universities

We are in the special training division of the Oak Ridge Institute of Nuclear Studies, and I would like to review it if I could. We have been involved for the last 21 years in giving intensive courses in a variety of fields. It started off with a basic course in radioisotope techniques that is being offered starting the Monday after Easter for the 116th time. This is not the same course as we had back then. It has not been revised 116 times, but possibly has been revised two dozen times in order to update it and keep it at the state of the art, or at the forefront as to what is new and what is going on in radioisotopes and their applications. This is the granddaddy of all the other courses---all the other things that we do---and this has mushroomed in the last few years into a course for physicians, courses for college professors of physics, chemistry, biology, courses for high school science teachers, and these courses range, most of them, for a period of from 4 to 10 weeks.

We do have an academic year program for the junior college and the college science teacher. We have not only the activities in Oak Ridge, but two activities outside of Oak Ridge. A mobile radioisotope laboratory that visits small colleges throughout the nation has been in most of the continental states and has been at almost 300 institutions in the last ten years. It will have a birthday in April, its tenth anniversary.

We also have an international program in which we do some of the same sorts of things we do in Oak Ridge in Latin America, and this is done in Spanish. We have written one of the more detailed manuals which includes not only experiments but also the extensive lecture notes in Spanish. We don't have the equivalent in English, unfortunately. The staff is going through the rigors of learning Portuguese since we are going to Brazil in the fall.

We have had about 15,000 people go through various programs that we have managed. We have a number of assets in our [illegible]ization and, I guess, I started off here to talk about people because I think the nature of your program and the quality of it will depend upon the people---the staff---whom you are able to convince that east Tennessee is a good place to live, even if you can't pay them.

Radioisotopes, where do they come from, how do you measure them, and how do you relate this number you get off the machine to something that is going on back in the system that they are trying to look at? This program is very, very heavy on the radiophysics instrumentation angle and also radiation health and this sort of thing. In the third or fourth week, it depends on the schedule, they do some experiments and even an autopsy is required sometimes. It is not planned, but we do it anyhow.

The participants we have had are people who have already been working in the field of radioisotopes so what we are trying to do is upgrade their understanding of what they have been doing, including sometimes telling them what is really the right way to set up the instruments. You can't always trust the salesmen to tell them how to set up the instruments---this is probably one of the most common comments we get in this business.

We think there is a contingent need for superimposing this kind of training on other existing programs for people already in the field. We are not dealing with preservice training, we are dealing with people already hired, already on the job somewhere, for short periods of time to upgrade them, to tell them the recent developments not only in the application but also in the instrumentation as well. There is also, I think, the possibility of a continuing type of activity as we have done with other fields.

The liquid scintillation course we are running in June is a 3-week course in liquid scintillation techniques in which we cover a rather narrow field in depth. I think there is a possibility for this sort of thing for the medical technologist---take a 1-week rather intensive program in one specific area and go into that in depth. We also make use of one of our assets, the flexibility of the staff. We take whatever group we have, at whatever level it happens to be, and start from there. We sometimes think we are going to be starting here but we wind up going down lower. We adjust ourselves to the group and go as rapidly as we can to bring the group as far along as possible. But we do have the capability of arranging for shorter term courses, even day visits. We have an increasing number of colleges within commuting distance, and more within a 500 mile radius of Oak Ridge, coming in for 2 days or even up to a week for the intensive programs. These are scheduled 10 hours a day for 5 days, in which you can cover a lot of material. I think this capability to offer continuing training to those who are planning the longer term program is most important.

ACTIVITIES OF THE SOCIETY OF NUCLEAR MEDICAL TECHNOLOGISTS

Ray Dielman, R.T.
Society of Nuclear Medical Technologists

We, the Society of Nuclear Medical Technologists, are primarily interested in establishing a thorough educational program. This Society is a multidisciplinary organization made up of former x-ray technologists, medical technologists, people with a Bachelor of Science degree, some with a high school education, and others with no affiliation whatsoever. Since our commencement in 1965, the Society has carried out programs of technical training and education, thereby providing a service to all technical personnel that had not been offered in depth by any other professional organization.

In 1968, the Society was asked by the American Medical Association to participate on the Ad Hoc Committee on Nuclear Medical Technology of the Council on Medical Education. The Society recently accepted the fifth revision of "The Essentials of an Acceptable Program in Nuclear Medicine Technology." The Society, along with the other societies represented, regards the Essentials as a minimum, as was intended. The Society believes there should be a minimum of 1 year technical training. The background of the students should be broad and include x-ray technologists, medical technologists, registered nurses, personnel with a Bachelor of Science or Bachelor of Arts degree, and personnel with a high school diploma and/or one of more years of college. The requirement would be dependent on the level of sophistication desired.

The level of training should be twofold: technician and technologist. The technician should ultimately have an Associate in Arts or Science degree consisting of 1 year of academic study and a 1-year course in nuclear medical technology in an approved nuclear medical laboratory. The Society feels that the real need for the associate degree technician is in the hospital of 300 beds or less. These hospitals are interested in properly-trained personnel and are not specifically interested in a technologist with a Bachelor of Science degree, although this is important for personnel who are to be associated with a university hospital, teaching hospital, or hospital over 300 beds, as well as for those who serve in an administrative capacity (chief technologist) in hospitals of all sizes.

Our original endeavors into education began with a yearly symposium at which we have had an average attendance of over 300 people from all over the United States, Canada, and the Philippines. The symposiums have been in Chicago for the past 3 years. In 1969, it will be in Atlanta, Georgia, and the following year in Dallas, Texas. Additionally, the Society attempted to fulfill part of the need for trained personnel by conducting a refresher course in nuclear medical technology. This course

of 2 weeks duration gave the technician and/or technologist a little bit of everything. The physicians, hospitals, and personnel associated with the course all concurred that it was quite beneficial. However, the Society has always felt the need for a course of at least 1 year's duration. Prior to our participation in the AMA program, we dropped the refresher course. Subsequently, a Continuing Education Committee was established and the 2-day seminars were conceived. These have been presented in several major cities.

The future holds the continuation of our annual symposium and business meeting. The reception to our continuing education seminars has been extremely successful and these will continue. These programs have recently been presented in New York, Atlanta, Baltimore, Phoenix, Detroit, and Milwaukee. The program consists of 2 days of didactic training presented by people considered specialists in various (nuclear medical) technical fields. For example, the programs include: scintillation detectors and gamma ray spectroscopy, scanners and stationary imaging devices, "wet work," radiopharmaceuticals, and nuclear medical terminology, radiation safety in regard to patient and technologists, and organ visualization. Programs are presented on a very basic level.

TRAINING AND EDUCATION ACTIVITIES OF THE SOCIETY OF NUCLEAR MEDICINE

C. Craig Harris, President
Society of Nuclear Medicine

Thank you, Guy. I would like to speak from three points of view: one, that of the Society of Nuclear Medicine; two, of our efforts at Duke; and three, as a person who is generally and broadly interested in the field of education in the allied health professions and services.

The Society of Nuclear Medicine, for the most part and largely up to now, has been an avocational scientific forum or communicating body. Its mission is relatively unfulfilled in terms of education, either the basic or continuing level. I think this stems largely from the fact that its activities are carried out mostly in an avocational way, blessed very few times with people who were so fortunate as to be able to give large amounts of their time to an effort that was consistent, not only with their own work, but with that of some rewarding mission of the Society as well. We have a couple of these individuals here with us today. Dr. Kaplan has labored long in that framework and so has Dr. Peterson in many ways. Largely, we are a scientific group that has no real means at this time to carry out a massive program of education in the allied or even clinical field of education. For that reason we are extremely interested in the proper emergence of academic programs that you have heard spoken of up to now.

I would not presume to know what Dr. Chapman would have said had he been here, but I would like to speak to the point that the Board of Trustees in the Society of Nuclear Medicine is pleased with the possible acceptance of the newly proposed "Essentials of an Acceptable Program of Education in Nuclear Medicine Technology," and the Board of Schools that it proposes. I think we all feel that this is a very important enabling step. First of all, it reiterates its position that the appropriate and reasonable body for accreditation evaluation of training programs in the Council on Medical Education of the AMA; this is a pragmatic fact. The participating groups are: The American College of Radiology, American Society of Clinical Pathology, the Society of Nuclear Medicine, American Society of Medical Technologists, American Registry of Radiologic Technology, and the Society of Nuclear Medical Technologists. I think that all of these groups have ratified this document and the next probable step is submission to and approval by the House of Delegates. At that point there will exist some means of evaluation of accreditation of educational academic programs in nuclear medicine technology. I think this is a tremendous and vitally important step.

Now we are all concerned with socioeconomic considerations. I think we are going to see a lot of preoccupation with this but we might as well face the fact that we would do best to set up programs of proper

education and not worry about the anomalous situations that are going to arise. A clinic or a small hospital that wants a technologist and wants her to do, perhaps, x-ray procedures and double in brass as nuclear med-tech, is going to pay in some cases enormously large amounts of money to persons with minimal training. I think we had better disregard this occasional response to the situation and go to win the whole football game---don't worry about losing a down or two. That is why I think the establishment of programs like you have at the University of Cincinnati is the right way to win a ball game.

Of course, we are all concerned, disturbed, and wondering about how we accomplish proper education of those who are on the job now. Dr. Akers spoke to this point.

In terms of the scientific activities of the Society, I am grateful to Dr. Haynie for his report which he will discuss with you.

I would like to hear more as the day wears on to see if there might be, in the allied health occupations, revolution, upheaval, or turmoil (I need a word here, I don't mean it quite that strongly). I think there is something of that sort going among the people of the allied professions across the board. There is a restiveness; there is uneasiness. We see it in the concerns of the inhalation therapists, the physical therapists, the occupational therapists. I don't know whether this is a nationwide thing.

At Duke we are new at the game of what we hope will be high quality training. We have discontinued our previous 1-month and 3-month short courses in favor of a 1 year program. Quite without realizing it we have set up a program that is similar in structure to the Nuclear Medicine Institute and I am sure Dr. Sodee will be happy to tell you about this. This was purest serendipity. We were very fortunate in enticing Mr. Barnett from Dr. Akers (and he has done nothing but remind us of this since we have been here). The things we have seen here make us feel quite humble. We have a lot to learn and so, selfishly for that reason, we are delighted to be asked here to this symposium.

To return to the starting point, I think the acceptance of the Essentials that you have before you is going to be a very important step along the way to motivate and sustain the institutions that want to get into high quality education in nuclear medicine technology and need guidance.

ACTIVITIES OF SOCIETY OF NUCLEAR MEDICINE COMMITTEE ON TECHNOLOGIST AFFAIRS

Thomas Haynie, M.D.
Society of Nuclear Medicine

The Society of Nuclear Medicine includes technologists among its membership, but it does not have a separate membership classification for technologists. The Society of Nuclear Medicine members working as technologists and technicians in nuclear medicine laboratories are classified according to academic degrees. Those holding an advanced degree, MA, MS, or Ph.D., are generally accorded full membership. Those with bachelor's degrees, BA or BS, become associate members. Those with associate degrees or no college diploma are classified as technical affiliates.

In 1963, the Society of Nuclear Medicine established an ad hoc committee on Nuclear Medicine Technologists to study problems related to this area of nuclear medicine. This was made a standing committee in 1966 and a special committee in 1968. Originally, the committee worked on educational requirements for nuclear medicine technologists. In 1967, partially as a result of this effort, an ad hoc committee of the Council of Medical Education of the AMA was formed to establish criteria for acceptable schools of nuclear medical technology. Since that time the work of the Society of Nuclear Medicine Committee on Technologists has been primarily in establishing a national council of technologists to advise the Society of Nuclear Medicine Board of Trustees and in promoting scientific and educational activities within the Society designed for the technologist.

As chairman of the Committee on Technologists, 1967-1968, I received a number of letters directed to the Society asking for information regarding schools of nuclear medical technology from technologists who wish to receive additional training in this field. Also, physicians interested in obtaining trained technologists inquired as to acceptable curricula and registries of trained people. Unfortunately, as no mechanism yet exists for approving schools or curricula, I was unable to help these people.

The present Special Committee on Technologist Affairs was formed and met for the first time in June 1968. There are 15 members, chosen from each of our chapters by nomination of the chapter president.

This committee discussed the problems of the technologist; my summary of the important problems brought forth by this committee is as follows: technologist members of the Society of Nuclear Medicine have not in the past been represented in the decision-making bodies of the Society and their status in the Society is not defined by the bylaws. Technologists wish to organize themselves on a local level and to

communicate with each other through scientific programs and journals where they do not have to compete with the physicians and scientists in the Society of Nuclear Medicine. Competing for space in the JOURNAL OF NUCLEAR MEDICINE leaves them at a disadvantage. Currently, within the Society of Nuclear Medicine, there is a divergence of opinion as to what should be done about the technologist and technician members. All that I, as Committee Chairman, could do was to attempt to define the problems. It will be up to the members of the Society themselves to find the solutions.

The technologists' scientific program was started as a feature of SNM meetings in 1967 under the guidance of Dr. Kaplan. It was repeated in 1968 and will be held again in 1969. The two previous programs have gone off well. The technologists present a type of paper that is different from the average paper on the SNM program. They present topics such as "Sequence of Performing Various Radioisotope Studies," "How to Perform a Brain Scan or a Pancreas Scan," "What Things Affect Blood Volume," "How to Elute a Technetium-99m Generator," and other practical topics of interest to a technician. Continuing education programs for the technologists are also offered by the Society of Nuclear Medicine. Some of our chapters have been conducting education programs at their meetings.

Finally, there has just been established a Committee on Education and Training of the Society of Nuclear Medicine which has a broad mandate to work in this area. This new committee will be looking into the area of technologists' education and training in the future.

ACTIVITIES OF THE VETERANS ADMINISTRATION IN NUCLEAR MEDICINE TECHNOLOGY TRAINING

Ervin Kaplan, M.D.
Veterans Administration

I am going to confine my remarks to the Veterans Administration's program in training nuclear medical technologists. The Veterans Administration is projecting a significant commitment in training allied health personnel. The magnitude of the program and its impact will be felt throughout the country. It is projected that 28,000 trainees in medicine and paramedical areas, including technologists of all sorts, will be in training within a year and this is projected to be 80,000 per year in 5 years. This will occur within a system of approximately 160 hospitals. Of these hospitals, there are approximately 80 that have nuclear medical facilities. The programs for the training of technologists have been submitted and are in the process of evaluation.

There are no programs in the VA that have been approved under the new program but some have passed through relevant committees. Currently there have been ten programs submitted that apparently will be approved. The training of 16 technologists and 16 physicians is contemplated in the first round, though I might indicate that no hospital has been approved for the training of technicians alone; the training of the technician is tied up with training of the physician. To my knowledge there are no published criteria or prerequisites in the training of these technologists. There is no uniform time of training; these programs are all somewhat different. They have originated independently in ten different hospitals. I would suspect that as time goes on some sort of overall plan should and must occur. However, allowing training to develop in ten different ways as a first round might be a very good idea because we might see which of the different approaches to the problem appears useful. The other thing I have indicated is that every attempt is being made to promote medical school relationships in the programs that are to be set up.

I will say just a very brief word about the program we are setting up. We intend to use the criteria established in the "Essentials of an Acceptable Program of Education in Nuclear Medicine" that is currently before the Council on Medical Education. It is a document that we are quite familiar with. We labored long and hard on it a number of years ago, and we are applying these criteria to training in our own hospital. The program is in its infancy and I look forward to considerable accomplishments in the future.

THE ROLE OF THE COMMUNITY COLLEGE IN PARAMEDICAL EDUCATION AND TRAINING

Hilmar Krueger, Ph.D., Dean
University College and the Raymond Walters Branch
University of Cincinnati

Mr. Simmons indicated that I should include a statement on the position the community colleges have taken in regard to the administration of paramedical programs and the future role the colleges are likely to play in meeting the manpower needs of medical laboratories. That is the assignment.

Since the beginning of the century, 2-year colleges have developed from a single one in 1904 to over 1,000 at the present time. In the last year or two they have developed at a rate of two every week. Some of these 2-year colleges have from 12,000 to 18,000 students, and their campuses compare favorably to campuses of baccalaureate institutions. These 2-year colleges have various names. Some of them are: Junior College, Community College, and Technical Institute. At the University of Cincinnati, we refer to our 2-year colleges as "branches" of the university. The 2-year colleges offer associate degrees in arts, science, applied science, or applied business.

Here at the University of Cincinnati I am Dean of three of them. One started last fall, one started 2 years ago, and one started 8 years ago. We have approximately 4,000 students in them and 2,000 of those students are in career-oriented programs or in technical education. We prefer the term "career-oriented."

As some of you know, there is a considerable controversy going on this day about the merits of technical education. The reason for the extraordinary development of 2-year institutions in the country is the fact that 2-year institutions are doing what no one else does. What they do is related to careers. Statistically, every professional man and/or the successful operation of his job or profession needs anywhere from three to seven to nine aides and assistants. The community colleges are now training the three to seven to nine aides and assistants to the professional people. We expect that by 1970 to 1972, professional people in this country will go up to about 12 to 15 percent of the population. You figure it out then. On that same ratio, 70 percent of the population will be in the area of assistants and aides or career-oriented people whom we in the 2-year institutions are educating and training.

Note that last autumn one out of every four college freshmen entered college through a 2-year institution. By 1972, the figure will be two of every four.

We use the term "career-oriented." We think it is a better term than "technician" because it permits us to educate and train nurses who are professionals, dental hygienists who are professionals, or inhalation therapists. At the Raymond Walters Branch we are in our second year of operation. Eleven of our 24 programs are health related. Premedicine, predentistry, and prepharmacy are traditional. Then we train medical secretaries, science laboratory technicians, nurses, and dental hygienists. We also have programs in radioisotope technology, x-ray technology, and inhalation therapy. Next autumn we begin a program in animal care technology.

This is the concept; we are attempting to develop in that institution a whole series of career-oriented programs related to health. We have 11 now and, I should say, in 5 or 10 years we will have 20 to 25. The concept is for this Raymond Walters Branch to serve as a complement to t' center. Certainly, we hope, at least, that 10 to 15 years from - will be a first rate medical center; some people think it i: I'll just say that it will be a first rate center. What we a.e trying to do is develop those oeople who will serve as aides and assistants to the professional people coming out of the College of Medicine and the medical centers. Even though these programs are career-oriented, even though they have some specialized-courses, 50 percent of the coursework is in the humanities, viz, psychology, history, speech, and English. Naturally, the humanistic courses are focused upon the specific areas, but since we are working in a rather limited health area, we can set up the common core program in the humanities in that fashion. When we give our chemistry, anatomy, physiology, or physics, the instructors giving those courses have a certain medical orientation. We think that we have a quality product that will be of first rate assistance to the professional people. We can't introduce the programs without the approval and certification of the appropriate agencies, and most of the graduates have to pass the state boards.

UNIVERSITY OF IOWA NUCLEAR MEDICINE TECHNOLOGY PROGRAM

Richard Peterson, M.D.
Veterans Administration

Our school offers the only other baccalaureate program in nuclear medical technology currently in operation. We started a year after the program here at the University of Cincinnati utilizing the facilities of University of Iowa Hospitals and the Veterans Administration Hospital in Iowa City. I have passed around copies of a scrapbook containing some things upon which I will briefly comment. This scrapbook may include some things to discuss at some other occasion. Our reasons for being interested in the baccalaureate program were similar to those expressed earlier. Locally, there was a very good medical technology program already in existence, producing 50 junior students each year, seeking a senior year of clinical training for medical technology. Locally, there is room for only 25 medical technology students in clinical training, so the rest had to seek their clinical training elsewhere. This pool of potential students and choosing the simplest means of getting going, resulted in our program being started as a variation of a nuclear medical technology option, under medical technology. However, our recommended prerequisites differed from those for medical technology in the following fashion: elimination of parasitology and addition of physics, radiation biology, elementary anatomy, and physiology.

In this scrapbook, we list some of the other things that come to mind when people ask why we choose to have a baccalaureate program: (1) In the job marketplace, nuclear medical technologists are commonly paid as well as school teachers. Why not have them equally well prepared? (2) A good baccalaureate program could facilitate the effort to develop the most competent technologists and multiply the amount of good patient care which the individual responsible physician can provide. (3) Such a program gives an increased capability to attract high quality students. (4) The BS program with a general science major offers something to build on, in terms of an educational ladder and vocational mobility: science teacher, graduate school, medical school, etc.

Obviously, we had to have some financial help in getting this started. Beyond that from local sources we are fortunate in having the benefit of a Developmental Grant (AHP-8-34A-68) for Nuclear Medical Technology from the Bureau of Health Manpower of the Public Health Service, DHEW. In this project we are going to try to evaluate a nuclear medical technology curriculum that is slightly different from what you see in this review copy that has been presented here from the University of Cincinnati. It looks like we are trying to give more chemistry than is being given here at Cincinnati. Flip back in the latter part of the scrapbook and I think we have some indications of what we aim to give in terms of radiochemistry

and radiopharmacy. Actually, this spring there is going to be a 2-week period where they will be exposed to lectures and demonstration of gas-liquid chromatography techniques and another 2-week period in liquid scintillation counting.

As we started this second year we had a series of multiple choice questions which all of the students were asked to complete. I don't have copies of the book of 300 questions for all of you, but if you would like to look at it, we will pass the single copy to you. They have taken this test during their first week and will do so again when they finish the course. When they take this examination the second time it will have additional questions and we will try to see in this fashion what increment of information has been acquired. They will also take such certifying examinations as are developed for NMT.

In an effort to have some added basis of judging what should go into this curriculum, we decided to try some task analysis. In our efforts at task analysis for NMT we have had the active participation and guidance of our College of Education counselling service, as well as the cooperation of one of the outstanding medical institutions of the midwest which provided us with their position descriptions for their radioisotope technologists. With these position descriptions and with the analogous experience represented in Air Force Task Analysis routines, we have worked out some forms for evaluating actually what tasks are performed by nuclear medical technologists. We will be seeking the cooperation of large medical centers, community hospitals, private laboratories, and research facilities to see the varying spectrum . tasks nuclear medical technologists are performing and thereby see if we are aiming appropriately in our endeavors. Task Analysis won't tell the full answer because in 2 or 3 years there may be a striking difference in the tasks asked of these people. We really have to project ahead in estimating what added training is going to be needed.

Our training product, the first two graduates, had no difficulties getting jobs. They were offered jobs at more than we could pay them so they went elsewhere. We hope we will succeed in retaining some of the second group of five students for our own needs. As they leave this training program they go into clinical service activities and/or research activities. With additional work experience I think these people will be useful in highly complex techniques, or become supervisors, or instructors, or chief nuclear medical technologists. What we hope to do in our program is give these people technical understanding, technical discipline, and technical judgment. I think if we can impart these, our technologists will be more valuable to physicians because they will require less supervision than many present technicians do.

This scrapbook also contains a sort of program description handout that is available to students in the University registrar's office, and which lists prerequisites, etc., on the back of it. The next sheet

lists the prerequisites actually as they have been revised this year. At the present time we are able to identify potential NMT students in their sophomore year and counsel them as to courses to take. We have also enjoyed the cooperation of the rest of the college in getting these prerequisites completed for the people entering the third clinical class. The rest of the scrapbook contains the outline of the clinical curriculum that was used the first year, another for the present second year, and some samples of student evaluation forms which have been utilized by the various instructors participating in the program. It's only a beginning.

TRAINING ACTIVITIES OF THE NUCLEAR MEDICINE INSTITUTE

Bruce Sodee, M.D., Director
Nuclear Medicine Institute

Two years ago we initiated a formal training program for nuclear medicine technology. The training period covers 1 year, with 3 months being spent in didactic training and 9 months in a clinical internship. The clinical internship is performed in our affiliate hospitals such as Georgetown University, George Washington University, Henry Ford Hospital, and Temple University. Our affiliate hospitals are programmed to give a broad clinical experience to the students and are headed by experienced men in the field of nuclear medicine.

During the 3-month didactic training period at the Nuclear Medicine Institute, the basic nuclear sciences are taught by a full time physicist, chemist, and nuclear medicine technologist. The student receives basic anatomy and physiology as well as an introduction to medicine through eight Board Certified physicians who spend approximately 4 hours per week teaching. Clinical nuclear medicine is taught by me during the students' last month. They are graded either satisfactory or unsatisfactory. Any student having difficulty receives individual attention since we have an excellent instructor-to-student ratio. During the 9-month clinical internship, the Nuclear Medicine Institute assigns monthly projects which involve mathematical exercises as well as a 2,000 word essay on an assigned nuclear medicine topic.

The 43 students enrolled in the Nuclear Medicine Institute have either been graduate x-ray technologists, registered nurses, or college graduates, and a highly selected group of five high school graduates. We have found that no matter what the background of the individual, they all have difficulty with mathematics, reading understanding and writing English and scientific language.

With our experience in the training of nuclear medicine technologists, we would like to make a plea that our future nuclear medicine technologists have a very strong mathematics and English language usage background. Our field is growing rapidly and our volume of literature is growing accordingly. The nuclear medicine technologist of the future has to be able to read and understand the literature so that he may be able to grow with the specialty.

ACTIVITIES OF THE AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS AND THE AMERICAN SOCIETY OF MEDICAL TECHNOLOGISTS

Newlon Tauxe, M.D.
American Society of Clinical Pathologists

The Board of the American Society of Clinical Pathology has, of course, been intensely interested in the training of technologists in the area of nuclear medicine. I believe that the consensus would favor the inclusion of training in this area into the general curricula of medical technology with inclusion of some questions dealing with radioisotopes in the general registry examinations. This has already been carried out. I personally would favor the idea of adding extra time to present curricula for those who would specialize in this area. For such technologists there has been provided a subspecialty registry examination for several years. This is analogous to programs in blood banking, etc. We have also stressed the value of shorter courses where technologist and clinical pathologist receive the training together. The ASCP sponsored a large national symposium of this sort attended by approximately 500 persons. For a first effort, I believe it was successful. I think the Oak Ridge group under Dr. Akers has made some efforts in this direction.

The Board has expressed approval of the fifth edition of the "Essentials of an Acceptable Program of Education in Nuclear Medicine Technology" as drawn up by the American Medical Association ad hoc committee. The Registry of Medical Technology has also approved of this document as it stands now.

I should like to make a few personal comments now. One hears a good deal of unqualified condemnation of on-the-job training programs. I think some of the condemnation has been a little too vehement. In fact, the vast majority of technologists working in the field today have received their training in this way. To provide oneself with good technical assistance, it is necessary that the on-the-job training be effective. There is obviously great motivation to devise for oneself the most efficient training program.

My personal experience has been involved with the training in nuclear medicine of 14 medical technologists, 4 radiologic technologists, and 3 persons not trained in medical disciplines at all.

For this experience, it seems to me:

1. That the most expeditious training is a mixture of formal and practical training, both of which require a good deal of my time.

2. That it required 6 to 9 months of intensive training to adequately make a nuclear medical technologist from a medical technologist or radiologic technologist.

3. That they require different courses.

4. That to make a nuclear medical technologist from one experienced in medical training requires about the time it takes to make a medical technologist.

5. If done properly, and it can be, on-the-job training is probably the most expensive mode of training.

In sum, I think we shall require three routes to competence in nuclear medical technology at the college level---two relatively short but different periods of training for the medical technologist and the radiologic technologist and a longer one for the high school graduate.

More time and experience will be necessary to evaluate the more expeditious course.

I have no experience with, and doubt that I could use in my laboratory, persons in whom college level of technology is not expected.

ACTIVITIES OF THE AMERICAN SOCIETY OF RADIOLOGIC TECHNOLOGISTS

John Tolan
American Society of Radiologic Technologists

I am a reluctant participant in this meeting. It is my personal view that the considerable quantity of time and money invested in gathering all of us at this place is a waste. I represent the American Society of Radiologic Technologists at this meeting, but these remarks reflect my personal opinion and not the "official" point of view of the ASRT. To serve the record, I will state my impression of the official point of view of the ASRT so that you will all know what it is.

> The American Society of Radiologic Technologists will cooperate with any organization, agency, group, or individual to develop a reasonable and honorable training standard for nuclear medicine technology. After 15 years of patient effort to accomplish this goal, the ASRT persists in hoping the approval of a program can be moved off "dead center."

With respect to my impression of the extent of the spirit of cooperation accorded this problem by the ASRT, I can say that had this meeting been scheduled to occur on-board Apollo 10, the ASRT would have sent a representative to express the spirit of "let's get on with this thing," but that representative would not have been me.

Each of you may know why there has not been agreement on what constitutes adequate training for the nuclear medicine technologist. For those who do not know, I will let you in on the answer, which is: NO TWO PEOPLE CAN AGREE ON THE DEFINITION OF NUCLEAR MEDICINE.

It follows, therefore, that no two people can agree on what is nuclear medicine technology. When the physicians who identify themselves as nuclear medicine specialists can agree on what <u>that</u> is, we can begin to identify the proper input for the training of a technologist.

Meanwhile, the radiologists who have migrated into this ill-defined branch of medicine have specified what they want in a nuclear medicine technologist. The pathologists have also made a commitment on what they want. The radiologist has said, in effect "give me a good, old-fashioned, x-ray technician with an extra year of training in isotopes and I will call him (or her) a nuclear medicine technologist." The pathologist has said, in effect "I know the radiologists are training x-ray technicians to be isotope technicians but <u>they</u> don't know anything about lab procedures; therefore, I will take a good, old-fashioned, lab technician and give him (or her) some training with isotopes and call the product a nuclear medicine technologist." The internist does not have an existing training empire to call upon, except for nursing training; hence, he does not know where to turn. He doesn't want an x-ray technician or a lab technician, but he doesn't really want a nurse either.

Let me attempt to define the ideal nuclear medicine technologist. He (or she) must be all of the following things:

1. A compassionate and sympathetic attendant of the sick patient.

2. An obedient and conscientious assistant to the physician.

3. An instrumentation engineer capable of maintaining complex equipment at a 100 percent use factor.

4. A radiation physicist capable of gamma spectrum analysis and internal dose calculations.

5. A radiochemist capable of isotopic analysis and radioassay procedures.

6. A cute young thing five foot two with eyes of blue. This category does not apply to the male technologist.

7. A person of independent means who doesn't really care about salary as long as there is an opportunity to serve mankind.

8. A person strongly motivated toward self-improvement who will use vacation time and personal savings to attend refresher courses and scientific meetings to improve his (or her) knowledge and professional standing.

9. A person who has completed some kind of college curriculum, or some kind of junior college program, or some kind of hospital-based program, or some kind of something.

I do not know where to find a technologist like this, but some of the plans for training I've heard about are headed in these directions.

Several years ago the ASRT formulated a proposed curriculum for the training of radiologic technologists. After several failures, their persistence succeeded finally in gaining an endorsement of the curriculum from the American College of Radiology. Through the jointly-sponsored American Registry of Radiologic Technologists, examinations for certification of nuclear medicine technologists began in 1963. Over 500 persons have been certified by this program. Independently, the American Society of Clinical Pathologists has been certifying nuclear medicine technologists through their Medical Technology apparatus. Though the requirements for certification are different, the examinations of the two organizations on nuclear medicine are essentially the same. At least, I have been told they are essentially the same by persons who have seen both examinations.

Now the AMA Council on Medical Education has entered the picture, as well it should. The ASRT has been trying for years to obtain approval for its curriculum. So far the ASRT has gained recognition for itself as one of six organizations having an interest in the training of nuclear medicine technologists. For more than a year, the concept of a Board of Schools to establish and govern standards of training has been discussed and carried forward from one semantic crisis to another. You have all received a copy of the fifth revision of the "Essentials of an Acceptable Educational Program in Nuclear Medicine Technology," dated December 17, 1968. Be assured there is no basic difference between the content of this document and the curriculum proposed by the ASRT in 1956, except that the present document makes much of the requirement that the whole thing must be "under competent medical supervision," whatever that means.

I do not wish to imply undue criticism of the AMA or its Council on Medical Education. After all, I realize the AMA and its member physicians achieved the kind of control they have over medical education by diligent attention to such details as, "Who is going to run the school, one of us or one of them?" The guy who drives the bus decides where the bus will go. If you want to drive, you must get there first or be big enough to unseat the driver. In this case, the driver has told us where he is going, and he has solicited our opinion on how we like the ride. So far, he is headed in the right direction and the ride is not too bumpy, but if he changes direction or drives too fast over a bumpy road, I think we should get off.

When the time comes to vote, I'll vote for the AMA, the BRH, the Board of Schools, and anything else that may help to get this thing moving again.

DISCUSSION

DR. KEREIAKES: I would like to ask Dr. Akers if there are any minimum educational requirements for persons who are planning to attend a short term course in nuclear medicine?

DR. AKERS: They may be medical technologists; we don't have any academic requirements per se. Most of them do have, I would guess, a minimum of 3 years. The next course is almost exclusively people with a baccalaureate degree who have gotten their experience, perhaps, through on-the-job training. We are taking only those who are working in the field of nuclear medical technology.

MR. GALPIN: To be fair to other individuals, we should point out that we are not the only ones in the Public Health Service. Dr. Peterson mentioned the fact of where they got support, and this body as a group might be interested in some of the programs in the Division of Allied Health that are available. I wonder if Dr. Kadish could speak on some of those points if he had an opportunity to do so. Just what types of general programs are available through your organization in the area of the allied health professions?

DR. KADISH: I could say a few words about this. The Bureau of Health Manpower, which recently became the Bureau of Health Professions Education and Manpower Training, has as one of its divisions a Division of Allied Health Manpower which is concerned with a range of health occupations other than physicians, dentists, nurses. These consist of some 85 to 125 occupations. The major funding mechanism which is available to the Division of Allied Health Manpower is the Allied Health Professions Personnel Training Act of 1966 which includes provisions for several programs and provides basic support for junior colleges, colleges, and universities which meet specified eligibility criteria. Basic improvement grants support is only for institutions that have existing programs; there is no provision for funds for new programs. A second part of that program supports construction in eligible training centers. There have been very few grants for construction.

The most broadly based part of the Allied Health Professions Personnel Training Act is the part that is known as Developmental Grant. This part of the Act was originally for the development of new types of health technology, but the Manpower Act of 1968 expanded it to programs to develop, demonstrate, and evaluate curriculums and methods for training health technologists, not necessarily new types. Applications for grants under this law are subject to competitive review. A number of Developmental Grants were funded in 1967 and those are still continuing since these grants run for as long as 5 years. There is one difficulty and that is that available funds will support the programs that began in 1967 and 1968 and the prospects for any funds for developing any new programs for the coming year are very limited. However,

the mechanism of Developmental Grants certainly is very useful and related to this whole field of nuclear medicine technology. The emphasis is on something new, a new curriculum or method or new methods of teaching. It might have the same curriculum but involve newer educational methodology.

DR. SAENGER: If I wanted to teach nuclear medicine in a submarine, would that be considered new?

DR. KADISH: Yes, that would be new---it certainly would be very innovating. The other point I want to make is that the Secretary of HEW is required to present a report of the administration of the Allied Health Professions Personnel Training Act of 1966, which is due in April and will include recommendations for new legislation. Under the existing legislation, specifically Basic Improvements Grants, there is no provision for starting a program, no matter how intense the need is, and there is no provision for supporting schools that have the greatest financial need. Some schools are quite adequate in their financial arrangements and their programs get the support, whereas the institutions that need it may not be eligible for support.

MR. DAHL: There was a basic amendment in the legislative process with respect to this Act that was originally designated to set up colleges of Allied Health Professions associated with medical schools only. The last day of the session it was amended in response to recommendations of the American Association of Junior Colleges and the National Education Association to make it clear that this was for all institutions with allied health programs, including junior colleges. This changes the participation from the 80 or so medical schools to some 1500 to 2000 or more eligible institutions and, of course, results in smaller grants to approved programs.

There is one other general point about the Public Health Service and its training activities. The testimony before Congress last year indicates that the basic educational support of medical schools and key professions is provided through the Bureau of Health Manpower. Most specialty training is provided through the operating programs, which are trying to push particular health areas. This is why the Bureau of Radiological Health and other programs in the Public Health Service are involved and concerned. We will make every attempt to work together. We can press for working closely on a technical basis and even make assignments of staff, like Mr. Simmons, to aid in developing projects. In contrast, the Bureau of Health Manpower would need a proposal for a self-contained project.

MR. HARRIS: Is it legal to change the subject a bit? I would like to respond to some of the points raised by Mr. Tolan.

Our effort is something of a fledgling thing and we have been experiencing many of the difficulties in our beginning effort that Dr. Sodee mentioned to you, such as the difficul[illegible]f communicating with students because their communicating skil[illegible]nd perhaps ours, too) are deficient. Then, because of this difficulty we began to look at the educational problem in an overall way and it seems to me that we are trying to match up one kaleidoscopic situation with another. We have a spectrum of people to be trained and a spectrum of ways in which this need is being met.

It seems to me that right off you can identify at least four classes of people. First of all, obviously, are those people who have not had training in any kind of technology, let alone nuclear medicine. Second, those who are employed in some context or another with some degree of training in a technology and who might be directed into nuclear medicine technology training. Third, you have a most difficult population---a population of people who have been practicing nuclear medicine technology for a long time and are completely unaware that there are vast amounts of it that they do not know or that they are doing poorly. Now, these are the people for whom a number of problems are going to arise. Finally, there is at least one other classification: happily, this day and time, people are involved in obviously recognized high quality programs. It seems to me that one thing has to come, and that is the development of the academically credited program. You just heard one good reason, this is where the Federal support is. They can do nothing for the OJT program.

Maybe, in their wisdom Congress has a proper thing going here for the simple reason that we think that in our hands a clinical internship is a good program. It may or it may not be. We have a great deal of evidence that some clinical OJT is not nearly effective, and I suspect that maybe the Federal government is wise in not being ready to fund this sort of thing. So we are considerably confused about whom we should be training and where we should get them.

If I may belabor the point a little bit more, one thing which has disturbed us very greatly is that in order to be successful in convincing our administrators and personnel people that a given technologist is worth a certain amount of money, we cite the fact that he is registered. But we are finding, in our operation at least, that this does not provide adequate proof of proper skill. I am suggesting that there might be some improvement in the registry examination.

Dr. Sodee has mentioned the deficiencies in the background of these people and, frankly and selfishly, this is why we are interested in taking into our program people who have been through at least part of an academically-oriented program, simply because they can be taught to read and write and study and learn. The inability of students to study and to learn have created the greatest problems for us.

It seems to me that the most important qualification is the one that Mr. Tolan started out with: a genuine concern with care of the sick patient. That and an ability to study and learn should, I think, be what we set up as entrance criteria.

We do not in all cases consider the RT as necessarily well-equipped to enter our program. Now, that is not a condemnation of RTs as such. We feel that the RT is probably the result of a life-long process of selection whereby he has avoided mathematics by intent or circumstance. This presents a great deal of problem here. The RT is good in terms of patient care but we sometimes have an uphill pull in other concerns.

I would like to suggest that maybe it is the point of this meeting to discuss whom we should be training and how we should do it. Is the academically complete program the answer; is OJT still reasonable; or what?

MR. SIMMONS: We have next, in order, Drs. Krueger, Saenger, and Wellman.

DR. KRUEGER: First of all, in regard to our 2-year program related to health, we demand high school graduation and generally 2 years of math and probably a year of chemistry, biology, or physics. In the first year, most of our programs have the general education core, the English, the science, and some history and some speech. But all of them also have a course in math or chemistry, anatomy, and physiology, and we set up the requirement that a student cannot enter upon the second year, or really upon a year of specialization, with a grade of less than "C" in the first year of math and the sciences. We eliminate a certain number from the specialized courses and they are ineligible to go on in the program. Since we have a program in nursing as well as a program for medical secretaries and a program in dental hygiene, quite often those students whom we exclude from nursing and dental hygiene fall into the program for medical secretaries. For medical secretaries, we demand grades of at least "C" in typing, shorthand, medical terms, and lab techniques before we permit them to go on. I think we have been fairly successful in weeding out people who shouldn't go on.

It seems to me that this would be the hope of the academically-oriented program. You are going to run into some who will not be persuaded that this is a good thing because it does not provide opportunity for continuing education for those who are in it now and may need it the most. I have noticed that a paranoia always seems to emerge when this new method or this sort of curriculum is proposed. Nonetheless, I think this is the right way to go in terms of preparing these people for technology.

DR. SAENGER: I think that the background of our program should be mentioned. I don't think that our trainees reflect a research orientation except for the fact that we were not able to train large groups of people in a rather small laboratory where most of our work is devoted to research activities.

The second thing is, and I think perhaps others agree, many of us in medicine are very much disturbed not only by what Mr. Tolan said but apparently by the way the radiological technicians feel about it. If you look into the history of training x-ray technicians, they have been trained largely in "schools run by hospitals," and ours is characteristic of this, where they have really run the x-ray department in turn for this on-the-job training. The amount of didactic training, or formal training, which they have received is in some places better than others and in some places, in my opinion, it is almost nonexistent, and the type of examination that has been offered has not been, to my way of thinking, particularly rigorous. When it came time to train these people in what I would have presumed was adequate knowledge of nuclear medicine, in the first place, they didn't know one end of a pipette from another. We were back in the position of having to offer courses in quantitative analysis and things of this sort, and, even though it is possible to practice a certain amount of nuclear medicine by getting pills from various suppliers, we don't happen to run our laboratory that way. I think if such individuals were faced with pulling something out of a bottle, they would not do it to my satisfaction.

The other thing was that they wanted to come over here for maybe 2 or 3 months and at that point go out and say they can do everything that a person can do who has spent 2 or 4 years in training.

Now, you can do all of these things. You can go for a certain amount of on-the-job training, but you can't expect people to take a formal training course and be willing to compete. I believe the x-ray training schools will go the route of what we call the associate degree as a good many of the rest of you have said. We now realize it is not fair to these young people to scrounge 2 years of work out of them so that they can go out and say they are one of Dr. Zilche's products. The question I would like to ask of Mr. Tolan is whether the American Society of Radiologic Technologists has approved this fifth draft, and if so, it would seem to me that this type of essentials would constitute their getting on with the program. Did I misinterpret this?

MR. TOLAN: Yes, I am responsible for a review of that draft and Pat Mueller from Dallas is the other delegated representative to the Board of Schools. We approved the fourth draft and will approve the fifth draft on the same basis - that it is high time people quit talking about this sort of thing and got it approved and into the works.

DR. WELLMAN: Dr. Sodee, your appeal apparently means that you want people to come to you with some kind of training other than what you have been encountering, since they haven't been capable of studying and comprehending material to your satisfaction. What background do you think they should have before they come to you, and why haven't they had it?

DR. SODEE: I believe the future nuclear medicine technologist should probably be the product of an associate degree program. However, the associate degree program may not be practical at this time as there are very few 2-year colleges ready or able to begin such a program. It is also extremely questionable whether any numbers of technologists could be produced from such a program in the next 10 year period. After being involved in a nuclear medicine technologist training program, I can only reiterate that these people should have a background of (1) English, (2) mathematics, (3) chemistry, and (4) physics before they enter into a scientific paramedical field such as nuclear medicine.

DR. WELLMAN: Do you intend in the future to change your criteria so that your candidates will have these qualifications?

DR. SODEE: At the present time, the Nuclear Medicine Institute is working with several colleges as well as universities developing an educational program in Nuclear Medicine Technology. We have found in many contacts in the state of Ohio, at the 4-year college level and, in several instances, at the 2-year branch college level, that there is a general misunderstanding as to what is necessary at the paramedical level in the field of nuclear medicine.

Finally, in talking to colleges that have Associate Degree programs, there is a feeling that the nuclear medicine technologist might get trapped at a deadend and not be able to move upward academically. We who have been working in the field of education in nuclear medicine say unequivocally that there is a need for intelligent paramedical personnel working with us in nuclear medicine. There is an apparent need for our students to have more background in the humanities as well as in English composition and basic mathematics. There is also no doubt in my mind that for the next 5 or 10 years we are going to have to depend on the registered x-ray technologist as well as the registered laboratory technologist to fill the void that we now have for personnel trained in nuclear medicine technology. It is going to take a great deal of time to train the quantities of people that we now need as nuclear medicine technologists.

DR. WELLMAN: If I am permitted some peaceful dissent, too, I take issue with Mr. Tolan's point that it is a waste of time to have this meeting. As a matter of fact, it seems a paradox that he made a plea in his talk that we move ahead with this training. That is the precise intent of this meeting---to move ahead. Continuing my dissent - in my discussions with our technicians here who have taken the ASCP or the ARRT

examinations in nuclear medical technology, I find the two exams don't compare at all. I think the ASCP test is a much higher caliber test and, as a matter of fact, I would say the ARRT test really doesn't "come up to snuff" and I think it matches to some extent the kind of training the radiological technicians have had.

As an objective criticism, many schools for radiological technicians have been purely OJT (on-the-job training) with meager academic backup. This is the type of training received by the individuals that Dr. Saenger and Mr. Harris have alluded to, training which does not practically prepare technicians for work in nuclear medicine laboratories. Technicians must have as a minimum the commitment and academic training provided by a curriculum such as Dr. Krueger's. I think that if the radiological technicians go on with the upgrade type of training Dr. Krueger is talking about, there is nothing wrong with the 2-year program in that it would have a good sound academic basis which it does not have thus far.

DR. KRUEGER: To get back to my earlier remarks, I indicated that we in the 2-year college are interested in developing supportive personnel to professional people and the specialized courses and the common core of sciences and mathematics then are related, if you wish, to specialized knowledge in the professions.

But secondly, you note, we have another common core and that is a common core in the humanities. Through this common core in the humanities we work hard to develop an ability, a facility for human relations, personnel problems, but most important, they make the person comfortable in the professional setting. This is what you also want. If a doctor hires a medical secretary, he wants that gal not only to be proficient in typing, shorthand, etc., etc., etc., but also to be comfortable in the setting of the clients, the patients of the doctor. And we are trying to do this within a 2-year period. This is why neatly structured common core courses are needed.

DR. KADISH: I want to amplify a few comments Dr. Krueger made, which will also probably relate to Dr. Sodee's comments. A major development in schools of allied health professions has recently developed. There is a relatively new association known as the Association of Schools of Allied Health Professions, which is based in Washington.

MR. SIMMONS: Mr. Tolan wanted to make a comment earlier to what Dr. Sodee said a few minutes ago.

MR. TOLAN: I would like to make several comments. Is this an appropriate time? With respect to the comment in my prepared statement about this meeting being a waste, I really hoped that by this afternoon I would change my mind, and I am already beginning to. But this was prepared the day before yesterday and that was my feeling at the time.

a slightly higher level, but we only do it once. Now, how many of you would say this is adequate? You are all experienced in this. Would you say this is adequate?

DR. HAYNIE: At The University of Texas at Houston, we conduct a course in isotopes and nuclear medicine for residents, fellows, and graduate students. We have accepted technologists with bachelor's degrees into this course and we find that some of the technologists do quite well, and the grade spread is not a great deal different between the physician and non-M.D. members of the course.

MR. SIMMONS: I have five people who want the floor in this order: Dr. Krueger, Mr. Dielman, Mr. Harris, Dr. Kaplan, and Dr. Tauxe, to be followed by Dr. Moore.

DR. KRUEGER: In regard to your remarks, you talk about lateral mobility. I think you ought to talk about the other mobility, too. As you well know, HEW is very, very sharp on this business of no dead-end programs. I think we in the 2-year programs are caught by the rigidity in the baccalaureate colleges, but there is no question about it, this development is coming. This upward mobility will be there and I think it is encouraged by the people in Washington.

I gave my last speech on manpower shortages in the health professions in Columbus. The figures I have indicate that in 1975 the health professions will be the nation's biggest industry, averaging 94 billion dollars a year. This is part of this whole buildup.

MR. DIELMAN: Several words have been used interchangeably here. We have talked about health professions, health occupations, a number of things; therefore, I would like to throw this in the pot: I believe the Radiologic Technologist Society and the Medical Technologist Society, along with SNMT, will agree that we want to be professionals and be known as professionals, not just work for professionals.

DR. SAENGER: Who wants to be a professional?

MR. DIELMAN: The technicians and technologists.

DR. SAENGER: What is your definition of a professional?

MR. DIELMAN: This has been an intertechnical group problem in the past because one group felt that they were more professional than the other because they had a college background and the other groups had no college background, but regardless, they all yearned to be professionals.

DR. SAENGER: I think in terms of the practice of medicine, a professional is defined by the laws of the States in that a physician is qualified to practice medicine, that is, to direct the diagnosis and care of a patient. I think it is quite clear that the technologist is not qualified in this particular role by virtue of law. If you don't like the law, you have to go to medical school or dental school or something of this sort.

Now, furthermore, I believe there is another distinction and I think we have to be very direct about that. It has been my experience that our technologists are very valued members of our team here, but nevertheless, a technologist, by-and-large, does not create or direct work. In other words, a technologist will take a project which has been developed or assigned and under specific guidance, which is relative I will admit, will carry out procedures requiring a high grade of competence. In fact, many times the competence of his particular act may be greater than that of the supervisor or physician, but initiation of the project is a different thing and frankly, Mr. Dielman, I don't mean to talk down to you or any of the technologists, but we think there is a very fine-line difference.

Now, in the grades of competence, usually the term "technologist" applies to 4 years of baccalaureate study and "technician" to 2 years of an associate degree program simply because we can't be talking back-and-forth. I think where the x-ray technicians have gotten a little bit of crust in the whole process is that somehow they have gotten themselves into 2 years of some kind of associate of arts training and they go for another year of on-the-job training, so they have got 3 years and they're not really quite fish or fowl. You find yourself then, John, in a position where someone says, "I can go 4 years and get a bachelor of arts or BS degree, or I can go 2 years and be a dental hygienist, so why should I go 3 years and be no better than a 2-year person?" And this is a problem that I think is unique, too. I think this has got to be solved because the push for the 2-year program has been decided by experienced people like Dr. Krueger who have said this is what students will hold still for.

MR. DIELMAN: I disagree in one area, I don't think that a technician's or technologist's wanting to become a professional means he wants to practice medicine. I am not implying that. I am saying that he wants to be well-founded in his particular discipline, which is technology.

DR. HAYNIE: I think there is an important semantic point to be made about technologists wishing to become professionals. A professional professes a body of knowledge and my interpretation would include almost any body of knowledge. One of the fundamental trends of our times seems to be for a trade to attempt to upgrade into a profession. There used to be only three professions: the ministry,

law, and medicine. In this century more and more trades have, through establishment of educational and certifying programs, made the leap to a profession. Is it not possible for the nuclear medical technologist to do the same by defining a fund of knowledge and establishing educational and certifying mechanisms to insure "professional" standards?

MR. HARRIS: It is really not related at this point, but I want to go back and pick up a point that Dr. Saenger inquired of some time ago. That is, "Are we heading to one big pool of allied health manpower or whatever that is?" There is in draft form, subject to review by the participating organizations, sort of a flow chart of the accreditation of allied health educational programs by the Council on Medical Education of the AMA. In this document they have tentatively identified basically 15 allied health occupations. Five of them follow the ASCP domain: certified laboratory assistants, medical technologists, medical laboratory technicians, medical technicians (this is really two levels of the same occupation). There are also physiology technologists, occupational therapists, physical therapists, medical record librarians, medical record technicians, inhalation therapy technicians, and the two kinds of RTs, radiologic technologist (formerly called x-ray technician) and the therapy technologist, the two levels of nuclear medicine technician-technologists, assistant and orthopedic assistant. There are going on, or at least proposed, four Boards of Schools to evaluate educational programs in these areas. This is the new structure of the allied health professions and concerns the Council on Medical Education, which is the proper accrediting group. In some categories, there already exist accreditation committees.

I think there is a moving off dead center, Mr. Tolan, in getting to be one out of the four out of several fields that has a Board of Schools, and I think we are beginning to more along a bit now.

Other parts of the flow chart I have here have to do with how many schools have been approved, where the essentials have been set up. Now, in the pathologist setup, the essentials all exist, three of them exist and have been revised once, and two are in the future stage. That is the way we stand now. I thought I might interject that into the record for the sake of information. It is fairly new and still subject to review, but it might give some insight to the answer to Dr. Saenger's question: Are we in a big morass of things we don't know about or are they well defined? I submit that there is definition here and a good outlook.

DR. KAPLAN: I would like to paraphrase something for my own clarification, to simplify it, and I think that what we are discussing is confused by the fact that we are not putting things in proper sequence. When one deals with a core curriculum, we are dealing with mathematics, physics, chemistry, biology, with the ability to read

and write languages and communicate. There isn't a special mathematics for nuclear medicine or physics and there isn't a special biology for anything. The problem arises when one specializes before he has acquired the fundamentals. Then he becomes restricted so that he cannot more up, down, sideways, or in any other direction.

I couldn't agree more with Dr. Krueger that the concept of a core curriculum that allows one to be a generalist prior to becoming a specialist simplifies the entire concept. In other words, we need a certain level of educational competence before a trainee can branch out and become a technologist. Reaching the associate degree level or the baccalaureate level is not relevant. What is relevant is that the individual should reach a level that allows him to develop on his own, because he then has the proper educational fundamentals. You can't have anyone read until he learns the alphabet. The alphabet of technology is the core curriculum.

MR. SIMMONS: We have just enough time for Dr. Moore's comments. Dr. Moore is known to most of you as he is Associate Commissioner, Environmental Control Administration (formerly Acting Chief of the Bureau of Radiological Health).

DR. MOORE: I had a very nice group of remarks that now have all been said while I was sitting back there, so you are spared that. I'll only tell a true experience that happened this past week. You were talking about training and most of you represent large institutions. I haven't noticed anybody from a small county seat type hospital. This past week I was in a small county seat hospital---100 beds, maybe. A patient had a very critical illness and would have died were it 10 years ago---anywhere---but for 10 years of progress. Somebody recognized that additional tasks could be done, a technician or a technologist was able to do them on a Sunday in a county hospital type laboratory. They came up with a low sodium and, frankly, started giving salt solution to a patient with congestive heart failure, and there was an almost miraculous turn of events.

Now I submit to you that this is a progress of training and this is what occurs when training gets out, when we get trained people spread all over the country. As you are responsible in your institutions for charting the course of events you lose sight of the "poor Joe" in the hospital bed who is going to make it or not make it in many respects depending on the doctor having enough sense to know that this test will help and ordering it, on his assistant (the technologist or technician) knowing how to conduct it, and on getting the report back to the doctor in time to do something about it. I think this is the ultimate end of what is helpful for the patient. When he is lying flat on his back, he just wants help.

We were trying to define professionals a few minutes ago and the term means something different to everybody. The English language is one of the poorest tools we have for trying to get our different ideas across because professionalism to me is something, to you it is something else, and I was thinking of other professions that required no education at all, yet are classified as professions.

It appears to me that you are doing the things here that must be done to progress, but someone has to come up with an idea, write it down, invite others to talk about it, and the distillation from it is how we have always made progress. We have never made progress by keeping it all up in our heads.

MR. SIMMONS: The afternoon portion of our colloquium will consist of four workshops, or discussion groups, which we hope will review and evaluate nuclear medicine technologist and technician training in light of this morning's discussions. At the conclusion of the workshops, the elected spokesman for each group will summarize his group's discussion and recommendations. To assist you, a list of discussion questions has been prepared. We have suggested to each panel that they concentrate on specific questions.

WORKSHOP DISCUSSION QUESTIONS

1. How can the current and future needs for additional technological personnel in Nuclear Medicine be estimated?

   Relatively, speaking, what is the distribution of the need for additional personnel in (1) large medical centers, (2) community hospitals, (3) private laboratories, and (4) research facilities?

   How will this distribution change in 5 years? in 10 years?

2. At what level(s) should people be trained to work in nuclear medicine as technologists? If more than one level is indicated, what are the relative numbers for current and future demands at each level?

3. How should training in nuclear medical technology be administered (i.e., colleges and universities, hospital-based program, etc.)?

4. What are the minimum qualifications for entering specialized training in nuclear medical technology?

5. What should be the content of the specialized training? How should the time be distributed among didactic training, laboratory exercises, and practical training?

6. Where should we recruit for students to enter nuclear medical technology training? What methods of recruitment should be employed?

7. Is there need for a clearinghouse for available positions? If so, how can this best be established?

8. What are the goals of the different government agencies in the area of nuclear medical technology training? What can be expected in the future with regard to promoting and supporting (1) training programs for new people entering the field, and (2) short-term training for the practicing technologist?

WORKSHOP I

Projections of Manpower Needs in Nuclear Medicine Technology (Discussion Questions 1 and 2)

DR. SAENGER: First, we couldn't tell how nuclear medicine was going to change in 10 years. With that in mind we estimated that there are at present, and I want to say that I had a very excellent experienced panel who gave all these figures, 100 medical schools. In the large communities where most university medical centers are located there are at least two other hospitals which would be about the size of medical centers. With these estimates and a little fudge factor, we came up with 500 large medical centers, 4000 community hospitals, and 3500 other hospitals. Then either Ken Williams, Floyd Galpin, or Dr. Sodee said that 40 percent of all hospitals in addition to these large medical centers have nuclear medicine laboratories. So then we argued among ourselves and decided that in big institutions the average number of technicians could be no more than three and at least one in the others. If you work this out, and several of us did this twice, you arrive at 4500 nuclear medicine technologists and technicians at present.

Then we said we would look at the need in 5 years. In 5 years we said that we would have, instead of 500 large medical centers, no more than 600 large medical centers and by that time, because we were all pretty good artists, we would go from three to five people in these large laboratories, two and a half in the community hospitals, and one and a half in the others. Now, notice that we did not figure that there would be a great deal of growth in the number of hospitals because several people in our group pointed out, and I think we have experienced this here in Cincinnati, that there is more of a tendency to relocate hospital beds than there is to build lots of new ones. Now, whether this is correct, I do not know. We also have projections that show a doubling of the percentage of hospitals with nuclear medicine labs. From these estimates we come out to about 15,000 individuals needed in 5 years.

We then agreed among ourselves, because we felt we had pretty well had our say earlier in the morning session, that these were only technicians and technologists, 2-year and 4-year individuals, about whom we are talking at this particular meeting. Then we said that, at the moment, considering that there are 500 large medical centers, there are probably not more than 200 people of the technologist grade (i.e., the equivalent of 4 years of training) working in this field in centers now. We felt that this number would not grow tremendously within 5 years---it would go from 200 to 600. As Mr. Dielman pointed out this morning, the major group would be technicians, who would go from about 4300 now to about 15,000 in 5 years. Where do you think the errors are in these estimates?

NOTE: To check the general validity of the above panel conclusions on estimated current and future manpower requirements in nuclear medicine, the following table was prepared, using data from the guide issues of *Hospitals* for the years 1965 to 1967. This reference gives the numbers and percentages of hospitals of various sizes and types that have nuclear medicine units.

Hospital category	Nuclear medicine units		Technologist and technician personnel needed			
			Per unit		Total	
	1969	1974	1969	1974	1969	1974
Large medical centers (500 beds)	500	500	3	5	1500	2500
Community hospitals (200-500 beds)	800	1000	1.5	3	1200	3000
Small hospitals (<200 beds)	800	1200	1	1.5	800	1800
Total					3500	7300

This table, which projects a lower manpower need, still indicates a doubling of the number of technologist/technician personnel needed to work in nuclear medicine in 5 years. From BRH preliminary manpower studies, the estimated upper limit of technologist/technician personnel presently employed in nuclear medicine is 2000, which indicates an estimated current deficit of 1500 individuals. Assuming an attrition rate of 20 percent per year, an average of 2500 students must be trained each year in order to have 7300 on the job in 1974.

DR. KAPLAN: There is a question I would like to ask. We are dealing with large hospitals, community hospitals, and small hospitals, but there is another category, the one of private laboratories and private physicians in group practice. Can you project the amount of technical help required in this last category?

DR. SAENGER: Well, first we would need an estimate of the present number of such private laboratories and private physicians in group practice. I think perhaps we could get one if we asked the American College of Radiology and the College of Clinical Pathology to tell us how many radiologists and pathologists have private offices or practices.

MR. WILLIAMS: You have to remember that many of these physicians work in more than one hospital as well as having some private practice on the side.

DR. WELLMAN: When we talk about a lab, what do we mean? Many labs may perform no scanning, just thyroid uptakes and in vitro studies. In my mind, such laboratories wouldn't qualify as requiring qualified nuclear medicine technologists, and possibly not even qualified technicians, and should not be included in our projections.

DR. HAYNIE: The figures for the technologists vs. the technicians don't coincide with my own thoughts on the matter.

DR. SAENGER: What do you think we ought to do?

DR. HAYNIE: Well, you have only projected one technologist for each large hospital, I gather. I think that each of your community hospitals ought to have a technologist and probably more than one in the large hospitals. I would prefer to see a 50-50 split between technologists and technicians.

DR. SAENGER: We are talking about 5 years from now.

MR. GALPIN: There are only two programs operating now.

DR. HAYNIE: You have only 200 technologists listed for now. I think that is too low because many hospitals have technologists with a bachelor's degree, or equivalent, who are doing nuclear medicine. I would include all of them in the technologist figures.

MR. GALPIN: But they haven't had the kind of training we are talking about as nuclear medicine technologists.

DR. HAYNIE: Well, aren't they still technologists?

MR. DIELMAN: We based this on the type of training we were talking about earlier in this program.

DR. SAENGER: You could easily double or triple this figure without affecting us to any degree. But the reason we stayed off of it was, as Bruce said, how are you going to get up to this level in a period of 5 years? We don't think it possible to generate that many bodies at this level.

DR. HAYNIE: I gather then that you are trying to be realistic rather than idealistic.

DR. SAENGER: Yes, absolutely. If you deal with as many people as we do in the Bureau of Radiological Health you have to be realistic.

MR. GALPIN: I think we did look at it just a little bit idealistically. When you look at it right now, you have only two technologist level training programs and in 3 years we have had something like six graduates.

DR. HAYNIE: Well, you see, I would call all of the people in my laboratory technologists, as they all have a bachelor's degree.

DR. SAENGER: How many hospitals are there like yours down in Texas?

DR. HAYNIE: Probably very few...According to the proposed ESSENTIALS, a BS Medical Technologist or RN has to receive only 1 year of nuclear medicine technology training to be qualified as a nuclear medical technologist. If this is the case, I believe it would be practical to train many more technologists than you have projected.

DR. KADISH: I do not know too much about manpower projection, but I do know that in considering where government allocations and funds will go, the gross national product is used as a basis and there are all sorts of demands for funds for various elements considered of high priority. That is, someone might make a big argument for increasing the number of oceanographers, as one example, and some people in the top levels in planning say, "Well, if the gross national product increases by such and such a percent, we should increase by such and such a percent the amount of funds that go into research such as oceanography," and on and on and on, so a lot depends on gross national product where emphasis is on priorities. I think this is some of the thinking that goes on in high level planning.

DR. SAENGER: Joe, I would like to give you a couple of speeches I have written recently. One of them deals with Bill 749 and one deals with how training in nuclear medical technology should be administered. We very quickly agreed to what everyone has agreed to, I think, this morning: that we have for the technician 1 year of what I am going to call college, plus 1 year of on-the-job training, which is their internship, and the 3 years plus 1 year for the technologists. But then we said there ought to be one other approach to this that would be important with the current situation of our society and that is that there should be an

effort, particularly in the disadvantaged portions of the population, to start with children at the 9th grade level and direct them toward careers in health with the idea that between the 9th, 10th, 11th, or 12th years, for 3 or 4 years, they would also learn English, arithmetic, etc., that Dr. Sodee discussed this morning as being such a chore in his program. This would be done with the idea that in the subsequent years of college or associate degree programs they would be in health career programs not necessarily in nuclear medicine technology alone.

It should also be possible to do that for which Dr. Sodee's program is, I think, unique now, and for which the University of Cincinnati has acquired one of its principal claims to fame, and that is that 2 years of college should be on some type of a co-op basis. The student would work for a bit and then go to school for a bit, and in that way they could get enough money that if Uncle Sam couldn't carry them maybe the program could.

WORKSHOP II

Entrance Qualifications and Content of Nuclear Medicine Technology Training Program (Discussion Questions 3, 4, and 5)

I think the panel consensus was that the associate degree, or technician, program should be a 24-month program in which four quarters of course work would precede the specialized training. This course work should include 12 quarter hours of English (language, composition, and literature), 9 quarter hours of social studies (including psychology and sociology), 9 quarter hours of mathematics (to at least provide competence in college algebra and trigonometry), 15 quarter hours of anatomy, physiology, and other biologic topics (particularly bacteriology), 12 quarter hours of chemistry (lecture and lab), and 8 quarter hours of physics. This totals 65 quarter hours of credit.

The bachelor's degree, or technologist, program would be a 4-year program, probably with a general science major, and would meet the general requirements for bachelor's degree programs of the college to which it is related. The 3 years of course work preceding specialized training should include 9 quarter hours of mathematics elective (to at least provide competence in college algebra and trigonometry, as for the associate degree), 28 to 30 quarter hours of anatomy, phsyiology and other biologic topics (including bacteriology), 28 to 30 quarter hours of chemistry (including general chemistry, organic chemistry, qualitative and quantitative analysis, and elementary biochemistry), and 12 to 15 quarter hours of physics. There would, in addition to these items, be the requirements for English, social studies, and foreign languages common to general baccalaureate programs. Are there any in the group who wish to make amendments to this outline?

DR. HAYNIE: I would like to make the comment that I thought the technologist program was deficient in mathematics and I was talked out of it because apparently premed students are not required to take any more math than college algebra and trigonometry. This might be all right for someone going into psychiatry, but for anyone going into nuclear medicine I think there should be required 2 years of college math including calculus.

DR. PETERSON: To which our rejoinder was that it would be difficult for individuals to accomplish the prerequisite course material, as set forth, within 3 years. It actually is very similar to that required for premedicine.

WORKSHOP III

Student Recruitment and Job Placement
(Discussion Questions 6 and 7)

DR. KRUEGER: The wise men of our group came up with the following suggestions. The first suggestion was, of course, to pass the buck. We thought that it might be a good idea for a central or national organization to look at this problem, perhaps either the Society of Nuclear Medicine or the AMA. Some type of a generalized brochure is needed that could be sent out to health careers and counsellor groups, and I'll describe these groups very shortly. This brochure should indicate the levels of training and the requirements that were just suggested or, at least, comparable requirements. Secondly, it seems feasible that the organization do what other organizations have done, that is, produce a film. After all, the dental hygienists have done so, the nurses have done so, and certainly the people you are trying to lure into the profession are medically oriented at the present time. Some type of film, as long as you keep it up to date, would be a good investment. Thirdly, we in this specific community have a very active Health Careers Organization, an excellent one, and this Health Careers Organization sets up health career programs in the high schools and arranges for the student tours of the various health related facilities. This Health Careers Organization lures into this type of visit anywhere from 1200 to 1400 youngsters every year. For instance, I, in my institution had, about 3 weeks ago, forty high school counsellors. The program was focused on health related programs and professions. We had them out, they enjoyed the facilities, we had tea for them. Guy Simmons was there, he was part of the program.

These approaches to which I have referred thus far should be complemented by another approach and that is the much more personal approach. I am talking about high school counsellors. You have to talk to the counsellors. These are the people in the high schools that count. It doesn't do any good to talk to an instructor in biology because he may be the football coach and he doesn't give a damn about your profession---you must talk to the counsellor. The youngsters look upon these counsellors as the fourth person in the Trinity. They have a great deal of confidence in them and you have to work through them.

A fifth item that we had, already referred to by Dr. Saenger---his group didn't think of it any earlier than we did, he merely presented the conclusions---he suggested that, and this is important, the youngsters should be approached in the 9th and 10th grades. There is no doubt about that because in the 10th grade they have to make up their minds whether they are going to do any more math or any more science. We must get to them and suggest the possibilities of health careers. There is some difference of opinion in our group about the merits of indicating how much they are going to earn. There seemed to be a certain reluctance among my colleagues as to what the figures would be. But these youngsters are going to ask, "How much am I going to earn?" and you might just as well face up to the question. For instance, I could tell a dental hygienist, if you

are good, you can in 2 or 3 years earn a salary in five figures. I know this to be true and this is a major talking point for these youngsters. This is the approach to associate degree candidates. Actually, the approach to the baccalaureate degree candidates is very similar. Obviously, the people who are in the associate degree programs, if they are any good, if they are outstanding, should be encouraged to go on, especially if the baccalaureate degree is going to be better than the associate degree.

I certainly urge you to produce films and your national organization ought to do it. Those that I have seen in nursing and dental hygiene are pretty effective and the reactions of the youngsters are very favorable. Now, the reactions of the oldsters are not as favorable, but after all, we are not trying to appeal to oldsters, we are appealing to the youngsters who are adolescents, who are romantically inclined, and this is the type of appeal.

Apparently there is a need for a clearinghouse for available positions. Again, our organization thought that the national organization ought to do something about it. The Society of Nuclear Medicine ought to serve, really, as a national clearinghouse and probably move down to its local chapters.

MR. HARRIS: Let me reply to Dr. Krueger. Their training film idea has been considered by the Society of Nuclear Medicine. We are right now in a position of announcing some virtuous aims. However I am reminded of my boss who keeps a saying over his desk: "Responsibility is not discharged by the announcement of virtuous aims."

We have just reorganized the committee structure of the Society of Nuclear Medicine and the Training and Education Committee could, in time, become the vehicle through which we produce information and training aids. We are just now reaching a point at which we might engage in such activities, perhaps with some additional help from outside groups or from government.

Now, the second point: the clearinghouse. It is not known by that name but as a "placement service." For the first time our Board of Trustees voted to establish this in the JOURNAL OF NUCLEAR MEDICINE. Again, it is just starting and we will probably have to fumble our way into business. We will need all of the help you can give us to make that a professional and functional activity.

WORKSHOP IV

Roles and Goals of Government Agencies in Nuclear Medicine Technology Training (Discussion Question 8)

MR. HARRIS: Our discussion group was charged with the question: What are the goals of the different government agencies in the area of nuclear medicine technology (and I took the liberty of changing that from "nuclear medical technology training"), and what may be expected in the future with regard to promoting and supporting training programs with (a) new people entering the field and (b) short-term training for the person already in the field? We took an hour simply identifying all the agencies interested and we didn't have any time to decide what the agencies could do for us. I am being a little bit facetious but the number of agencies concerned here is large.

Now, the motivation, the enablement of all this, comes, as Dr. Kadish mentioned this morning, in the original Manpower Training and Development Act. Our present situation seems to be enabled and controlled by this Act, which was originally designed to function at the collegiate level. As related this morning, the Act was amended at the last minute to open the way for support of programs at the 2-year community college level. Also, its original intent was to direct the highest priority to persons directly involved in patient care, but lately the Act has been extended to less-related programs.

An event to look for is the publication of the report that the Secretary of HEW has been directed to assemble and disseminate, which is coming up in the near future. This may be our "NACOR Report" of 1969 because of its impact on developments in this field.

Of the agencies we can identify at the moment, several are represented here. Dr. Kaplan, for example, represents the Veterans Administration, where the effort is under the Assistant Chief Medical Director for Research and Education. They have been implementing a rather large training program. I haven't seen any paper on the technology side of that, but it is coexistent with the physician training program, as I understand it. It is just getting off the ground in terms of the nuclear medicine aspect and, consequently, a lot of that is yet to be seen.

The Department of Labor is interested and has some involvement. I know the Bowman Gray School of Medicine is getting some support from them. Their support primarily seems to be of the logistical type. All of the other agencies seem to be interested in goals, methodology, curricula, etc., whereas Labor is providing support in terms of stipends and travel or purely logistic consideration to determine needs, etc.

The Atomic Energy Commission has three divisions that are involved in technology training: the State and Licensee Relations Division, the Division of Technical Information, and the Nuclear Education and Training Division, which provides direct support of the intensive nuclear medicine technology training courses at Oak Ridge Associated Universities.

The Department of Health, Education, and Welfare seems to be the most concerned of the big agencies. Of course, the Bureau of Radiological Health has a direct interest in this under the Training and Manpower Development Program. There is also the Bureau of Health Professions Education and Manpower Training (it is pretty soon going to be part of NIH) and its Division of Allied Health Manpower. Dr. Peterson's program at the University of Iowa, of course, is funded under the Training and Manpower Development Program.

Other agencies interested but not represented here include the National Cancer Institute, the National Institute of General Medical Sciences, and the Office of Education. Grants are available to nonprofit agencies, organizations, and institutes in support of new health technologies. In the Office of Education there is the Bureau of Vocational and Technical Education, concerned with secondary schools and junior colleges. There is also the Bureau of Research, which is supporting the Technical Education Research Center (TERC) which we understand made a survey and projected a 5-year need on the order of 20,000 nuclear medicine technologists. They made the survey as part of phase 1 of their nuclear medicine curriculum project, which also includes determination of job duties and required skills, etc. The second phase is going to be the development of a proposed nuclear medicine technology curriculum. The next phase would be the establishment of prototype programs or prototype schools to test the curriculum.

It has been proposed that there should be an information center for Allied Health Programs that might be of help to the general public in determining where one goes for various kinds of assistance. One very important point did come out of our conference: This is such a can of worms that, if you have an interest, you should write to someone you know in an agency involved and hope that he can pass on your request to the one concerned within the right framework. Until this information center is developed, what else can we do? I think this is the best straightforward pragmatic proposal that was made.

The NIH Health Manpower Developmental grant support program apparently has funds for continuations only at this stage. However, the intent of the law is to provide support for new health technologists, including nuclear medicine technologists. One thing I would like to have read into the record is "for the full development, demonstration, and evaluation of curricula and methods for the training of technologists."

I think we all recognize that one of the big problems is going to be matching up of the rather diffuse sets of possible supports with a rather diffuse set of needs. I don't think we are quite ready to match them up just yet. The actual matching up is certainly going to be done by individuals like Dr. Sodee.

There is one other point I would like to make before giving my colleagues a chance to second-guess me: it is impossible to tell what impact Dr. Saenger's projection will have on actual future developments. It is like throwing some mud in a tub of water. You can't ever determine what the water would have been like if you had left it "unmuddy." The Society of Nuclear Medicine was adked on a crash basis to provide a rough draft of new guidelines to be used by the Joint Commission for Accreditation of Hospitals in the 1969 edition of their standards. What was Standard 5 under the radiology guidelines now becomes a separate section, Nuclear Medicine, listed as an ancillary service. The publication of these guidelines is going to inform a lot of small hospitals of an entity that many of them are unaware of, or are relatively uninformed about today.

DR. SODEE: Does the Regional Medical Health Program tie in at all with manpower development?

DR. KADISH: Yes, that program is concerned with continuing education for all kinds of allied health workers to upgrade their skills to fit the needs of programs associated with heart disease, cancer, stroke, and related diseases.

DR. SODEE: I mention this because we have been busy in the last year with these particular groups and in the Cleveland area we have a number of hospitals that need help. They are very interested in developing new programs for allied health technologists. In addition, Dr. Saenger's program comes close to the Appalachia federal program, which is another source of funds that should be tapped.

DR. HAYNIE: I should like to point out that Dr. Krueger's reference to the Society of Nuclear Medicine Committee on Technologist Affairs as the Technical Affiliate Affairs Committee is an inaccuracy that is frequently made by the members of the Society themselves. Many of the technologist members of the Society of Nuclear Medicine are not classified as technical affiliates. I would guess that about half of our technologists are associate members, and it seems I have to constantly remind people of that fact.

QUESTION FROM THE FLOOR: We weren't sure whether the Society had a committee on education and training. Has this been formulated this year?

MR. HARRIS: The Society of Nuclear Medicine adopted new bylaws effective at the June meeting in St. Louis and established six standing committees. A technologist committee was not among them. We did bring

into being a Committee on Education and Training, which will be the committee concerned with education of the nuclear medicine technologists. The committee includes Dave Kuhl, chairman, Bel Burrows, Tom Haynie, Bill Beierwaltes, Ed Siegel, Howard Stern, and Newlon Tauxe. They have been organized into a series of subcommittees with special interests. The subcommittee on technologist training consists of Dr. Haynie and Bill Beierwaltes.

MR. SIMMONS: Before too many people start to leave, I want to say a few words about what we want from you regarding the training manual. The copies that you have are yours to keep, but they are review copies and are marked as such. There are many mistakes in this review copy, which we will correct. Hence, we are not asking for your editorial comments, but rather your overall impression of the manual as far as its usefulness in training technologists is concerned. Any suggestions you might have as to how we can improve the manual will also be welcome. As you review the manual, please keep in mind the topics that we intend for it to cover. We realize that it is not all-inclusive, and when you read the preface you will see that there are only certain portions of the total training program in which this manual will be used. Also, each one of you will receive a copy of the proceedings of this meeting.

DR. SAENGER: Do I get the feeling from what little has been said about the draft of the essentials of the nuclear medicine training program that there is relative accord as to the fifth draft?

MR. SIMMONS: There might be one exception to that. The American College of Radiology has not been heard from yet, have they?

MR. HARRIS: I had a note from Dr. Chapman the other day in which he said all but one group had ratified it and I identified that, perhaps mistakenly, as the pathologist group.

DR. SAENGER: Let me only say this about The American College of Radiology: its committee on nuclear medicine is going to meet in New Orleans at the Society of Nuclear Medicine meeting and I will bend every effort to make it produce some action.

MR. SIMMONS: This concludes our colloquium on Nuclear Medical Technology Training. The proceedings will be published as a Bureau of Radiological Health report. Copies will be forwarded to all participants. We sincerely appreciate your participation.

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APPENDIX A

COLLOQUIUM HANDOUT: UNIVERSITY OF CINCINNATI NUCLEAR MEDICAL TECHNOLOGY PROGRAM

I. DEMAND

The rapidly increasing use of radioisotopes in medicine has resulted in an acute shortage of qualified technologists to work in this highly specialized field. Excellent job opportunities are not available in hospitals, university medical centers, and research centers.

II. DUTIES

Working under the supervision of a physician, the nuclear medical technologist uses radioisotopes in the diagnosis and treatment of disease. The technologist operates nuclear counting and scanning equipment, quantitates the resulting data and performs various radiochemical procedures. Much of the work involves direct contact with patients.

III. CURRICULUM FOR BACHELOR OF SCIENCE DEGREE IN MEDICAL TECHNOLOGY WITH NUCLEAR MEDICINE OPTION[1]

Freshman Year

1st Quarter	Cr.	2nd Quarter	Cr.	3rd Quarter	Cr.
Eng. 101 (Comp.)	3	Eng. 102 (Comp.)	3	Eng. 103	3
Chem 101	3	Chem 102	3	Chem 103	3
Chem 111 (Lab.)	2	Chem 112	2	Chem 113	2
Math. elective	3	Math. elective	3	Math. elective	3
Foreign language	5	Foreign language	5	Foreign language	5
Phys. Ed.	1	Phys. Ed.	1	Phys. Ed.	1

[1] Course descriptions for the freshman, sophomore and junior years are in the College of Arts and Sciences catalog. This catalog may be obtained by writing the Registrar, McMicken College of Arts and Sciences, University of Cincinnati, Cincinnati, Ohio 45221.

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Sophomore Year

1st Quarter	Cr.	2nd Quarter	Cr.	3rd Quarter	Cr.
Eng.(Lit.elect.)	3	Eng.(Lit.elect.)	3	Eng.(Lit.elect.)	3
Chem 204 (Org.)	4	Chem 205 (Org.)	4	Biochem 206 or elective	4
Biology 101	5	Biology 102	5	Biology 103	5
Soc. Study(hist., econ., soc., poli. sci.)	3	Soc. Study	3	Soc. Study	3
Phys. Ed.	1	Phys. Ed.	1	Phys. Ed.	1

Junior Year

1st Quarter	Cr.	2nd Quarter	Cr.	3rd Quarter	Cr.
Phil. or Psych.	3	Phil. or Psych.	3	Phil. or Psych.	3
Anal. Chem. 341	3	Anal. Chem. 342	3	Lit., Psych. or social study	3
Anal. Chem. 351	2	Anal. Chem. 352	2	Biol. 203(Anat. and Physiol.)	3
Lit., Psych or social study	3	Lit., Psych or social study	3	Physics 103	5
Biol. 201 (Anat. and Physio.)	3	Biol. 202 (Anat. and Physio.)	3	Bacteriology 271	4
Physics 101	5	Physics 102	5	Elective	4

Senior Year

The senior year is a 12 month hospital internship program during which the student receives both formal training and practical experience in the Radioisotope Laboratory of the Cincinnati General Hospital.

Course	Credits Per Quarter			
	Summer	Fall	Winter	Spring
Nuclear Physics & Instrumentation	6			
Radioisotope Measurements		6		
Radiation Protection			3	
Tracer Methodology & Radiopharmaceuticals				3
Hematology & Laboratory Chemistry Lectures		1	1	
Clinical Applications of Radioisotopes		1	1	1
Technical Evaluation of Nuclear Medicine Procedures	2	2	2	2
Clinical Nuclear Medicine and Hematology Practicum	6	6	6	6
	14	16	13	12

IV. DETAILS OF SENIOR YEAR COURSES

Since the senior year courses (except for Hematology and Laboratory Chemistry Lectures) are newly-developed and specialized, they are outlined below in some detail.

Nuclear Physics and Instrumentation: This course is designed to provide the student with the fundamentals in physics, mathematics, and principles of nuclear instrumentation necessary for him to understand the physical aspects of the use of radioisotopes in medicine. Course content is as follows:

I. Atomic Structure
   - A. Electron Configuration
   - B. Nucleus
     1. Nuclear particles and their properties
     2. Nuclear binding energy

II. Radioactive Decay
   - A. Modes of Decay
   - B. Units of Activity
   - C. Mathematical Decay Law

III. Interaction of Radiation with Matter
  A. Corpuscular
  B. Electromagnetic

IV. Principles of Radiation Detection Instruments
  A. Gas Ionization Instruments
    1. Ion chambers
    2. Proportional counters
    3. G-M counters
  B. Photographic Emulsions
  C. Scintillation Detectors
  D. Semiconductor Detectors
  E. Thermoluminescent Media

Radioisotope Measurements: This course is a continuation of the instrumentation part of the "Nuclear Physics and Instrumentation" course which is prerequisite. The "Principles of Radiation Detection Instruments" section is used as a stepping stone to discuss various nuclear counting systems with emphasis on operating characteristics. Course content is as follows:

I. Operating characteristics and associated electronics of each of the following instrument systems
  A. G-M Counters
  B. Ion Chambers
  C. Proportional Counters
  D. Scintillation Detectors
    1. Integral counters
    2. Spectrometers (includes scanners)

II. Principles of In-Vitro Counting
  A. Absolute
  B. Relative

III. Principles of In-Vivo Counting
  A. Whole Body
  B. Distributive
    1. Scanning
    2. Quantitative measurements
  C. Kinetic Studies

IV. Statistics of Nuclear Radiation Counting

V. Quality Control of Counting Systems

* * * * * * *

Laboratory sessions for these two courses include:

1. Determination of operating voltage for an integral laboratory counter.
2. Determination of counting efficiency.
3. Determination of the half-life of a radionuclide.
4. Calibration of a single channel pulse height analyzer.
5. Calibration of a multichannel pulse height analyzer.
6. Interpretation of a gamma spectrum.
7. Five two-hour sessions on organ scanning using phantoms.

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Radiation Protection: In this course safe handling of radioactive materials is stressed. Emphasis is placed on maximizing the diagnostic information obtained from a procedure while minimizing the radiation exposure to both the technician and patient. Course content is as follows:

I. Units of Radiation Exposure and Dose
   - A. Roentgen
   - B. Rad
   - C. Rem
   - D. RBE
   - E. Quality Factor
   - F. Dose Equivalent

II. Biological Effects of Radiation
   - A. Cellular effects
   - B. Macroscopic effects

III. Radiation Protection Guides

IV. Radiation Protection Instrumentation
   - A. Survey Instruments
     1. Beta - Gamma
     2. Alpha
   - B. Personnel Instruments
     1. Film badges
     2. Pocket chambers
     3. Thermoluminescent dosimeters

V. Basic Principles of Radiation Protection
   - A. External
     1. Time
     2. Distance
     3. Shielding
   - B. Internal
     1. Good housekeeping practices
     2. Protective clothing
     3. Proper pipetting techniques

VI. Emergency Procedures

Tracer Methodology and Radiopharmaceuticals: The chemical and biological basis for using the radioisotope as a tracer are discussed in this course. Properties and methods of production of radioactive tracers are also covered. Course content is as follows:

I. Tracer Methodology

II. Properties of Radioactive Tracers
  A. Physical properties
    1. Half-life
    2. Type and energy of emissions
  B. Chemical properties
  C. Biological localization

III. Methods of Production of Radioactive Tracers
  A. Nuclear reactors
    1. Fission products
    2. Neutron activation
  B. Cyclotron
  C. Generators

Clinical Applications of Radioisotopes: This course consists of a series of lectures on varied topics of interest. Each one is presented by a specialist in his subject. Lecture titles include:

1. Diagnostic use of ^{131}I (2 lectures)
2. Therapeutic use of ^{131}I
3. Radioisotopes in Ophthalmology
4. Regulations for Radioisotope Use
5. Technical aspects of Scanning
6. Liquid Scintillation Counting
7. Hematologic Studies with Radioisotopes
8. Methabolic Studies with Radioisotopes
9. Dynamic Function Studies
10. Lung and Cardiovascular Blood Pool Scans
11. Brain Scanning
12. Bone Scanning
13. O.B. and Gyn Radioisotope Studies
14. Liver Scanning
15. Spleen and Pancreatic Scanning
16. Therapeutic use of ^{32}P and ^{198}Au

17. Whole Body Counter Applications
18. Cyclotron Production of Radionuclides
19. New Developments in Radiopharmaceuticals and Short Lived Isotopes
20. Principles of Radiopharmaceutical Preparation

Technical Evaluation of Nuclear Medicine Procedures: This portion of the training consists of sessions held at the end of each day in which a staff physician, along with other staff members, reviews and interprets the studies performed on that day. These sessions (approximately one hour each day) provide a much needed correlation between the work the technologist performs and its significance in the practice of medicine. The student is able to see directly how the work he has done each day fits into the overall diagnosis of each patient. Also the importance of the technical factors and how they affect the final interpretation of a study is stressed in these sessions.

Clinical Nuclear Medicine and Hematology Practicum: This portion of the curriculum will provide the student with practical experience in diagnostic and therapeutic procedures performed with radioisotopes. Approximately 30 hours per week will be spent in this activity. The students work under the close supervision of staff physicians and experienced nuclear medical technologists and learn, by doing, all of the procedures performed in the Radioisotope Laboratory. These include metabolic studies, thyroid tests, diagnosis of gastrointestinal, cardiovascular, and urogenital diseases, localization of tumors, hematologic studies, etc.

The student also spends time in the clinical hematology laboratory where he performs differential blood counts and other hematologic procedures.

V. TUITION

Tuition for the freshman and sophomore years is outlined in the University of Cincinnati College of Arts and Sciences catalog.

Tuition for the junior and senior years is paid by the Public Health Service.

VI. CERTIFICATION

Graduates of this program are eligible to take the certification examination in nuclear medical technology given by The Registry of Medical Technologists of The American Society of Clinical Pathologists.

VII. RADIOISOTOPE LABORATORY STAFF

Staff Members associated with the Radioisotope Laboratory include:

Eugene L. Saenger, M.D., Professor of Radiology and Director of Radioisotope Laboratory

James G. Kereiakes, Ph.D., Physicist, Professor of Radiology

Gustave K. Bahr, Ph.D., Physicist, Assistant Professor of Radiology

Edward B. Silberstein, M.D., Assistant Professor of Radiology and Instructor in Medicine

Guy H. Simmons, M.S., Physicist, Public Health Service Staff Assignee, Instructor in Radiology

Henry N. Wellman, M.D., Assistant Professor of Radiology

VIII. RADIOISOTOPE LABORATORY EQUIPMENT

The Public Health Service has augmented the facilities of the Cincinnati General Hospital for the purpose of developing an academic curriculum in Nuclear Medical Technology. Equipment available for clinical work and training includes:

1. Ohio-Nuclear 5" Detector Scanner
2. Picker Magnascanner (3" Detector)
3. Nuclear-Chicago Pho-Gamma
4. Nuclear-Chicago Multi-probe
5. Nuclear-Chicago Automatic Gas Flow Counter
6. Packard Auto-Gamma Spectrometer
7. Nuclear-Chicago Single Channel Analyzer
8. Whole Body Counter
9. Packard Automatic Liquid Scintillation Spectrometer
10. Victoreen Multichannel Analyzer
11. Two Packard Multichannel Analyzers
12. Varied Survey Instruments
13. Electronics Laboratory
14. Small Animal Counter
15. Several In Vivo and In Vitro Detectors

TECHNICAL REPORTS

(continued from inside of front cover)

MORP 68-8 Dental X-ray Teaching and Training Replica (PB 182 854 $3.00)

MORP 68-9 Development and Evaluation of an Automatic Collimator for Medical Diagnostic X-ray Machines (PB 180 528 $6.00)

MORP 68-10 Survey of the Use of Radionuclides in Medicine: Preliminary Report (Superseded by BRH/DMRE 70-1)

MORP 68-11 Dental Surpak Summary Report (PB 184 356 $3.00)

MORP 68-12 Particle Accelerator Safety Manual (Supt. of Doc., GPO-$1.25) (PB 178 325 - microfiche only)

MORP 68-13 PHS Film Badge Program (In preparation)

MORP 68-14 Radiation Safety Recommendations for X-ray Diffraction and Spectrographic Equipment (PB 182 558 $3.00)

DMRE 69-1 Report of the Task Force on X-ray Image Analysis and Systems Development (PB 184 130 $3.00)

DMRE 69-2 Symposium on Past, Present, and Future State X-ray Programs (PB 184 481 $3.00)

DMRE 69-3 Medical Radiation Information for Litigation (PB 187 697 $6.00)

BRH/DMRE 70-1 Survey of the Use of Radionuclides in Medicine (PB 188 619 $3.00)

BRH/DMRE C70-2 Automatic Data Processing System Study for Massachusetts General Hospital Diagnostic Radiology Department (PB 193 937 $3.00)

BRH/DMRE 70-3 A Training Manual for Nuclear Medicine Technologists (Supt. of Doc., GPO-$1.75) (PB 196 441 - microfiche only)

BRH/DMRE 70-4 Cyclotron Production of ^{123}I - an Evaluation of the Nuclear Reactions Which Produce This Isotope (PB 196 162 $3.00)

BRH/DMRE 70-5 The Use of Radioactive Materials in Gas Chromatography (PB 195 970 $3.00)

BRH/DMRE 71-1 Summary of Federal Regulations for Packaging and Transportation of Radioactive Materials (Supt. of Doc., GPO-$0.50) (PB 197 698 - microfiche only)

BRH/DMRE 71-2 X-ray Fluoroscopic Screens - History, Crystal Kinetics, Preliminary Report on "Aging" (Supt. of Doc., GPO-$0.60) (PB 198 239 - microfiche only)

BRH/DMRE 71-3 Storage and Handling Devices for Radium

BRH/DMRE 71-4 State and Federal Control of Health Hazards from Radioactive Materials other than Materials Regulated under the Atomic Energy Act of 1954